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Nova Scotia Technical College

Calendar

Halifax, N. S.

1913-14

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CALENDAR.

1913

August 30, Saturday, Registration for Civil Engineering Summer Camp.*

September 1-20, Civil Engineering Summer Camp.

September 22, Monday, Registration for College Classes.

September 23, Tuesday, Lectures begin.

October—, Saturday to Tuesday, inclusive Thanksgiving vacation.

December 24, Wednesday, Christmas vacation begins.

1914

January 5, Monday, class work resumed.

January 8, Thursday, Short Course for Land Surveyors begins.

January 19, Monday, Mid-year examinations begin.

January 28, Wednesday, Second Semester begins.

February 3, Tuesday, Short Course for Highway Construction begins.

February 28, Saturday, { Short Course for Land Surveyors closes. / Short Course in Highway Construction closes.

May 13, Wednesday, Final examinations begin.

May 22, Friday, Commencement.

May 26, Tuesday, Summer vacation begins, Summer Mining School begins.

June 27, Saturday, Summer Mining School ends.

*Note:—Students intending to attend Civil Engineering camp must notify the Secretary of the College on or before August 15th, 1913.

PROVINCE OF NOVA SCOTIA.

Council of Public Instruction.

Hon. G. H. Murray, M. P. P., Premier and Provincial Secretary.

Hon. O. T. Daniels, M. P. P., Attorney-General.

Hon. E. H. Armstrong, M. P. P., Commissioner of Public Works and Mines.

Hon. G. E. Faulkner, M. P. P.

Hon. J. W. Comeau, M. P. P.

Hon. R. M. McGregor, M. P. P.

Hon. James McDonald, M. P. P.

Hon. Jason M. Mack, M. L. C.

A. H. MacKay, Ll. D., Superintendent of Education, Secretary.

NOVA SCOTIA TECHNICAL COLLEGE.

Board of Governors.

Prof. F. R. Haley, M. A., Acadia University.

Prof. C. D. Howe, Dalhousie University.

Prof. J. B. McCarthy, University of King's College.

Prof. L. Killam, University of Mount Allison College.

Rev. H. P. McPherson, D. D., University of St. Francis Xavier College.

Prin. F. H. Sexton, Nova Scotia Technical College.

Prof. J. W. Roland, Nova Scotia Technical College.

Prof. W. S. Ayars, Nova Scotia Technical College.

Prof. E. A. Holbrook, Nova Scotia Technical College.

NOVA SCOTIA TECHNICAL COLLEGE.

Instructing Staff.

F. H. Sexton, S. B., Principal and Professor of Mining and Metallurgy.

W. S. Ayars, M. E., Prof. of Electrical and Mechanical Engineering.

J. W. Roland, A. B. ,S. B., Professor of Civil Engineering.

E. A. Holbrook, S. B., Professor of Mining and Metallurgy.

G. F. Murphy, B. E., Instructor of Mining and Metallurgy.

C. A. Hodge, S. B., Instructor in Electrical and Mechanical Engineering.

Francis M. Dawson, S. B., Instructor in Civil Engineering.

Judge W. B. Wallace, Lecturer on Law of Contracts.

{ Capt. T. Montague Bates, / Lieut. E. O. Alabaster, } Lecturers in Military Science.

H. Piers, Librarian and Curator of the Museum.

L. B. Taylor, Secretary.

W. J. Butler, Jr., Engineer.

E. H. Nauss, Stenographer.

GENERAL STATEMENT.

Foundation and Purpose.

The Nova Scotia Technical College was established by the passing of "An Act Relating to Technical Education" on the 25th day of April, 1907, by the Governor, Council and Assembly of Nova Scotia.

The aims and scope of this institution are outlined in the Public Statutes of Nova Scotia, 1907, Chapter 1, Sections 5–11.

"5. There shall be established at Halifax an institution for the purpose of affording facilities for scientific research and instruction and professional training in civil, mining, mechanical, chemical, metallurgical and electrical engineering or any other departments which may from time to time be added.

"6. The institution shall be called the Nova Scotia Technical College.

"7. The Governor-in-Council is hereby authorized to borrow a sum not exceeding $100,000 and to expend the same in securing a site, erecting a building and providing adequate apparatus, plant, books, materials and appliances for the purposes of said institution.

"8. The Council of Public Instruction may from time to time make such rules and regulations as it deems expedient for the efficient conduct of the said institution, and may amend or repeal the same.

"9. The Director of Technical Education shall be the Principal of the said institution.

"10. The Council of Public Instruction shall, upon the recommendation of the principal, appoint such professors and instructors as the Council considers requisite for the purposes for which the institution is established.

"11. (1) The members of the teaching staff of the institution, having the rank of professors, and such representatives of any university of the province or elsewhere, as the Council may select, shall constitute a body corporate, under the name of the Nova Scotia Technical College.

"(2) The said corporation shall have power to grant such degrees as it may determine, to prescribe the several qualifications therefor, the course of study to be pursued in the several departments, and, in respect to all matters of discipline and all matters connected with the educational work of the institution, shall have the conduct and control thereof.

"(3) In the event of any part or parts of the course of study prescribed for the first and second years being included in the educational work done in the universities recognized by the Council in this province or elsewhere, the Council of Public Instruction shall exclude such parts from the course of study of the said institution."

During the session of the Provincial Legislature in 1908-9, an additional $100,000 was voted for the construction and equipment of engineering laboratories.

During the session of 1909-10, the Legislature appropriated a further sum of $50,000 for a mining and metallurgical laboratory.

During the session of 1911-12, the Legislature appropriated an additional sum of $39,000 for buildings, equipment and apparatus.

Engineering Building.

The main building of the Technical College, which contains the lecture rooms, science laboratories, museum, library, gymnasium, and assembly hall, has been completed three years. It is an imposing building of pressed red brick and freestone, erected on the military property adjoining the Court House on Spring Garden Road, in Halifax. This main structure is 146 feet long, 48 feet wide, and has two wings, 41 by 52 feet each.

In the basement, room is provided for a work shop, fan room, store room, assaying laboratory, balance room, metallography laboratory, locker room, cement laboratory, and gymnasium.

The first floor contains the administration offices, museum, curator's office, geological laboratory, lecture rooms, electrical measurements laboratory, electrical research laboratory, dark room, and heat laboratory.

On the second floor are the staff offices, library, chemical laboratory, chemical research laboratory, lecture rooms, drafting room, and assembly hall. The building has a steel frame, reinforced concrete floors, and is of slow burning construction throughout.

Engineering Laboratories.

The main building for the engineering laboratories was erected in 1909. This building, 40 x 160 ft., contains the central power plant, mechanical engineering laboratory, machine shop, materials testing laboratory, and hydraulic laboratory.

During the year 1911-12 the Murray Laboratory of Mining and Metallurgy was completed and the equipment partly installed. The details of the building and equipment are given in the following paragraphs.

Mechanical Engineering and Testing Laboratories.

Space has been provided for a sample grinding room, supply room, workshop, lecture room, drafting room, testing laboratory, office and lavatory. The main portion of the building consists of one large space which is devoted to metallurgical and ore dressing processes.

The equipment for sample grinding consists of 1 Braun Chipmunk Crusher, 1 Braun Disc Pulverizer, 1 Braun Rotary Hand Grinder, 1 Allis-Chalmers Type B Sample Grinder, 1 Gates Sample Crusher, Type F. This sample grinding apparatus is driven by an independent 5 H. P. three phase, Westinghouse motor.

The equipment for metallurgy will consist of a blast furnace for smelting lead and copper ores, a hand reverberatory roasting furnace, an English cupelling furnace, a copper refining furnace, experimental cyanide plant, a pot roaster, a Bessemer convertor for copper mattes, a small coking oven, etc.

The ore dressing equipment consists of a coal washing plant as manufactured by the Jeffrey Mfg. Co., for the United States Government Coal Testing Laboratory, 1-7″ x 10″ Blake Rock Breaker, 1 Type O D Gates Gyratory Breaker, 1-5′ Huntington Mill, 1 set 10″ x 12″ laboratory crushing rolls, 1-6″ vertical mill elevator, 1 set standard trommels, 1-2 compartment laboratory Harz jig, 1- Richards Pulsator gi, hydraulic cone classifiers, 1-½ size Wilfley concentrating table, 1- standard 4′ Frue suspended vaimer, 1 James Slime Table, 1-5 stamp mill with 350 lb. stamps and Hendy Challenge Feeder, 1 Frenier Sand Pump, 1 magnetic separator.

There is installed in the building a model mine plant with 1-30 H. P. upright tubular boiler, 1-10″x10″x10″ Ingersoll straight line compressor, 1-5″x6″ Lidgerwood friction hoist with 10″ drum. It is planned to make every student in mining engineering thoroughly familiar with these fundamental machines before graduation.

In this Mining and Metallurgical Laboratory industrial research on the mineral resources of the province will be prosecuted.

College Government.

The governing functions of the Nova Scotia Technical College are vested in a Board of Governors and the Council of Public Instruction. The Board of Governors consists of one member nominated by each of the five recognized and affiliated colleges and universities in the Maritime Provinces, together with the professors of the teaching staff of the Technical College.

This Board makes all regulations in regard to admission requirements, general curriculum, and other matters which concern the general standard and welfare of the College. The Board of Governors is under the supervision and control of the Council of Public Instruction, and all regulations made by the former body must receive the ratification of the latter.

Affiliation.

The Nova Scotia Technical College is affiliated with the following universities,—Acadia, Dalhousie, King's, Mount Allison, and St. Francis Xavier. By the terms of the affiliation, the separate universities offer a uniform course in engineering covering the first two years, and the Technical College offers professional courses in several departments of engineering covering the last two years course. Students from the separate universities are admitted to the Technical College on certificate without examination under certain conditions enumerated later. The matriculation requirements for entrance into the uniform engineering course of the separate colleges are also uniform and are to be found in the succeeding paragraph.

Admission to the First Two Years' Engineering Course in the Affiliated Universities.

Applicants for admission must have attained the age of 16 years.

Acadia, Dalhousie, King's and St. Francis Xavier have accepted amended requirements for admission which were put into force in September 1911. The following is an outline of the subjects and the standard or grade in each subject which is required for admission as a regular engineering student:

1. *Arithmetic and Algebra*:

   Arithmetic.
   Algebra, as in Grade XII. or equivalent.

2. *Geometry and Trigonometry*:

   Geometry as in Grade XII. or equivalent.
   Trigonometry: Plane Trigonometry, as in Grade XII. or equivalent.

3. *English*:

   As in Grade XII. or equivalent.

4. *French or German*:

   As in Grade XI. or equivalent.

5. *History*:

   As in Grade XI., or English and Canadian History.

6. One of the following:

   (a) *Latin*, as in Grade XI. or equivalent.

   (b) *Greek*, as in Grade XI. or equivalent.

   (c) Additional work, equivalent to that required for Grade XII. in the language chosen in Subject 4.

Regulation for Students Conditioned in Matriculation.

"No student shall be admitted to the full work of the first year of the engineering course who is deficient in Mathematics, or more than one other matriculation subject. Any student who has more conditions than outlined above, may enter College and take a combined Arts and Engineering Course, provided he can satisfy the matriculation requirements of that college. Such a person cannot be considered a regular first year student in engineering, and will require three year's work to complete the first two years of the engineering course. All matriculation requirements must be removed before the student can enter the second year of the engineering course."

In plain language this means that a sharp distinction shall be drawn between the regular student who has passed all matriculation requirements and a student who has not attained the required standard. Any student who fails in matriculation examination in Mathematics, or in more than one subject, will have to take another year in the Academy and pass the Grade XII. examinations, or else he may attend college as a conditioned student, and take up the subjects in which he was conditioned in the first year Arts Course of the college which he attends.

It is better for the average student to spread the first two years engineering course over a period of three years, so that he may be better grounded before entering the Technical College, and it is earnestly recommended that students should pursue this course.

Mount Allison has not yet accepted these new regulations for matriculation, so that the same requirements as were in force in 1910-11 will obtain at Mount Allison University in New Brunswick for the year 1912-13. They are as follows:

1. *Arithmetic and Algebra*:

   Arithmetic.

   Algebra as in Hall and Knight's Elementary Algebra, excepting Chap. 41.

2. *Geometry and Trigonometry*:

   Geometry: Euclid, Books I. to VI., inclusive.

   Trigonometry: As in Murray's Plane Trigonometry, Chaps. I. to VIII., or equivalent; or Practical Mathematics, as in Grade XI.

3. *English*:

   As in Grade XI. or equivalent.

4. *French or German*:

   As in Grade XI. or equivalent.

5 *History*:

   As in Grade XI. or English and Canadian History.

6. One of the following:

   (a) *Latin*, as in Grade XI. or equivalent.

   (b) *Greek*, as in Grade XI. or equivalent.

   (c) Additional work equivalent to that required for Grade XII. in the language chosen as *Subject* 4.

   (d) *Mechanical Drawing*: Projection of points, lines, plane figures, and simple solids, dimensioned sketches and working drawings of simple machine parts, lettering and dimensioning of drawings neatly and accurately done.

Note—In all cases where mechanical drawing is offered, as in No. 6 (d), all the plates must be submitted, together with certificates stating where the drawing was done.

Regulations for Conditioned Students.

The following regulation was adopted by the Governing Board in 1909 for those applicants who do not attain the required proficiency in every matriculation subject, as outlined above.

"No student who has been conditioned in more than one subject of matriculation shall be admitted to the full work of the first year of the engineering course, and all matriculation conditions must be removed before a student enters upon the second year of the course."

This regulation *does not mean* that a person who is conditioned in more than one subject cannot go to a college and begin to study for the engineering course. It *means* that such a person will not be considered a *full first year student*, and will probably have to take two years at that college in preparing to enter the second year of the engineering course. It *does mean* also that a student must not have any matriculation conditions in entering the second year of the course.

Admission to the Technical College.

Applicants must have attained the age of eighteen years.

The students who enter the Technical College will be classified as *regular* or *special*. Regular students are those who are full candidates for degrees, and special students are those who voluntarily, or by reason of not having passed all requirements up to the time of classification, are taking special courses.

Admission to the Technical College will be on certificate from the properly authorized officer of the university at which the student has pursued his first two years engineering course. This certificate must state the subjects taken, the marks made in each subject, and the pass mark required at that university in engineering courses. Certificate blanks will be furnished on application to the Principal of the Technical College.

Regular students will be admitted temporarily to the Technical College who have secured the required proficiency in *all the courses* of the first two years Engineering Course as hereafter outlined.

Special Students will not be permitted to take more than three courses simultaneously.

Note—The following temporary exception has been adopted:

Regular students will be permitted to enter the Technical College who are *conditioned in one subject only* of the first two years' course, provided that that subject is not one of the following:

Mathematics, Physics, Chemistry, Surveying or Drawing.

The right, however, is reserved to exclude as a regular student anyone who has failed in any other subject of the preliminary course than those specified above.

Admission to Advanced Standing in the Technical College.

Any person may be admitted to advanced standing in the Technical College by passing such examinations as are deemed necessary by the college faculty, or by submitting such certificates of previous records of study or experience

as shall satisfy the faculty. All applications for special examinations for advanced standing must be made to the principal of the college before September 1st, 1912.

Admission to Special Classes in the Technical College.

Any person on the payment of the required fee and the production of evidence to the faculty of sufficient knowledge and training to benefit by the instruction in any separate class or classes given in the Technical College, may enter and pursue such class or classes as a special student.

Degrees.

To whomsoever shall satisfactorily acquire the requisite proficiency in all the regular courses of either Civil, Mining, Mechanical or Electrical Engineering as prescribed in this calendar shall be given by the Technical College a degree of Bachelor of Science in that department in which he has pursued his studies.

Certificates.

Anyone attending one or more classes in the Technical College and attaining the requisite standard of proficiency in said class or classes shall, on application, receive a certificate attesting to the exact work done.

Tuition Fees, Deposits, Etc.

The tuition for instruction in any regular department of engineering shall be seventy-five dollars ($75) per year, forty dollars of which shall be paid within one month of the opening in September and the remainder during the first month of the second term, which begins usually in February.

To those who are attending special classes the fees are as follows:—

For any single class for one-half year	$ 7 50
" any single class for one whole year, or for two classes for one-half year	12 00
" three classes for one-half year	18 00
" four " "	23 00
" five " "	28 00
" six " "	33 00
" seven " "	38 00
" eight or more classes for one-half year	40 00
" seven or more classes for whole year	75 00
Short course for Land Surveyors	15 00
Short course in Highway Construction	free.

A deposit of $5.00 shall be required of all students taking laboratory classes on entrance to the same to cover breakage or damage to apparatus. An itemised account of supplies or damages to apparatus used by students will be rendered at the end of the year for settlement.

Scholarships.

There is one free scholarship of a value of seventy-five dollars ($75.00) for each of the eighteen counties of Nova Scotia, except the counties of Halifax and Cape Breton, for which there are two free scholarships each. These scholarships are to be awarded on the basis of need and merit after the results of the mid-year examinations. The applicants for scholarships must have been *bona fide* residents for three years in the county for the scholarships for which they are seeking. If there is no applicant in any one year for a certain scholarship, a student, resident in any other county for three years previous may by permission of the Faculty apply for the vacant scholarship and may be awarded the same by the Faculty.

First Two Years' Uniform Engineering Course in the Affiliated Universities.

Acadia, Dalhousie, King's and St. Francis Xavier have amended the two years' uniform engineering course in their respective universities. Following is the outline of the amended courses as they will be carried out after September, 1911, in the above colleges:

I. **Mathematics**—

Minimum.

1. *Solid Geometry* ..... 24 hours.
2. *Analytical Geometry* ..... 48 hours.
3. *Calculus*: Differential and Integral ... 96 hours.

II. **Chemistry**—

1. *Gen. Chemistry*: Lectures ..... 72 hours.
2. *Gen. Chemistry*: Laboratory ..... 96 hours.
3. *Qualitative Analysis*: Lectures ..... 24 hours.
4. *Qualitative Analysis*: Laboratory ..... 96 hours.

III. **English.**—

1. *English Composition* ..... 48 hours.

IV. **Drawing**—

Freehand: Mechanical and Machine . 240 hours.

V. **Physics**—(Including Mechanics, Electricity, Heat, Light and Sound:

1. Lectures and Recitation ..... 120 hours.
2. Laboratory ..... 120 hours.

VI. **Surveying—**

1. Lectures..... 48 hours.
2. Field work, mapping, and topographical drawing..... 144 hours.

VII. **Descriptive Geometry—**

Lectures, Recitations and Drawing..... 72 hours.

VIII. **General Geology—**

Lectures..... 48 hours.
Laboratory and Field Work..... 72 hours.

IX. **Kinematics—**

Kinematics of Machines..... 72 hours.

X. **Workshop**..... 216 hours.

Regulations For Conditioned Students.

Regular students are those taking full courses for degrees. Special students are those who, voluntarily or by reason of not having passed all requirements, are taking special courses, and may or may not be pursuing their studies with a view of obtaining a degree. Regular students will be admitted who have secured proficiency in all the required subjects but one, provided that subject is not one of the following:

Mathematics, Physics, Chemistry, Surveying or Drawing.

The right, however, is reserved to exclude as a regular student anyone who has failed in any other subject of the preliminary course than those specified above.

Students entering the Technical College deficient in any of the required entrance subjects will not be allowed to take any course for which that subject is prerequisite.

Special students will not be permitted to take more than three subjects simultaneously.

Prerequisites.

Any student who wishes to take a special course in the Technical College must have previously passed the course which will enable him to benefit by the advanced instruction. The prerequisites for the regular courses are given in the following table:—

Mechanics of Engineering	Mathematics and Physics.
Railway Location	Trigonometry and Surveying.
Thermodynamics	Mathematics and Physics.
Drafting and Advanced Surveying	Trigonometry and Surveying.
Roads and Pavements	Surveying, Trigonometry and Geology..
Machine Design and Drawing	Drawing and Kinematics of Machines.
Machine Design	Drawing and Kinematics of Machines.
Electrical Machinery	Physics.
Electrical Laboratory	Physics.
Applied Geology	Geology.
Quantitative Analysis	Chemistry.
Principles of Metallurgy	Chemistry.
Mine Surveying	Surveying and Descriptive Geometry.
Mechanical Engineering Laboratory	Kinematics of Machines.
Assaying	Chemistry.
Mineralogy	Chemistry and Geology.

If a student, however, wishes to study some special course and does not wish to count this toward a degree, he may be allowed to take such course at the discretion of the Faculty of the Technical College upon his presenting a signed statement that he does not wish the work to count toward a degree.

Details of Courses in First Two Years Engineering Course.

Some attempt has been made to unify some of the special courses so that instructors in the different Colleges may have some plan that they could follow.

So far the instructors in Physics have agreed upon a course in Laboratory Physics which would cover the work outlined in the requirements with an alternative of 10 experiments in Electricity and Magnetism in the place of experiments 45, 46, 47, 48 and 49 on Light.

1 Vernier caliper. Measurement of length and volume.
2. Micrometer caliper.
3. Spherometer. Radius of curvature
4. Reading by vibrations. Sensitiveness of a balance
5 Method of double weighing Weight in vacuo.
6. Verification of the law of moments.
7 Verification of the laws of equilibrium of three forces acting at a point.
8. Verification of the laws of equilibrium of an extended rigid body under the action of three forces.
9. Centre of gravity of a weighted bar.
10. Mechanical advantage and "efficiency" of a combination of pulleys.
11 Coefficient of friction.
12. Determination of "g" by means of a simple pendulum.
13. Verification of Hooke's Law. Young's Modulus by stretching a wire.
14. Moment of Inertia. Moment of Torsion.
15. Use of the barometer. Corrections to be applied to the reading.
16. Density of solids and liquids by means of a chemical balance.
17. Density by means of Nicholson's Hydrometer.
18 Density by Jo ly's Balance.
19 Proof of Boyle's Law for air.
20. Velocity of waves in a stretched string
21. Determination of pitch by the sonometer.
22 The resonance-tube. Velocity of sound in air.

23 Velocity of sound in brass. Kundt's method.
24. Testing the fixed points of a mercury thermometer.
25. Coefficient of linear expansion of a solid
26. Coefficient of cubical expansion of a liquid. The weight thermometer.
27. Specific heat. Method of mixtures.
28. Latent heat of fusion of water.
29. Rate of radiation. The plotting of "cooling curves."
30 Mapping the magnetic field around a bar magnet. Moment by neutral point.
31 Moment of a magnet by oscillation method.
32. Moment of a magnet by deflection method.
33. Magnetic inclination or dip.
34. Determination of "H" by the magnetometer.
35. Tangent galvanometer. Sine and tangent methods of measuring currents.
36. Electro-chemical equivalent of copper.
37. Determination of "G" or "H" by the deposition of copper.
38. Proof of Ohm's Law.
39 Measurement of resistances, B. A. Bridge.
40. Specific resistance.
41. Temperature coefficient of resistance.
42. Wheatstone Bridge. (1) Resistance of a galvanometer. (2) Resistance of batteries.
43. Comparison of electromotive forces.
44. Verification of Joule's law.
45 Comparison of intensities of illumination by means of a photometer.
46. Verification of the laws of reflection from (1) a plane mirror, (2) a spherical mirror.
47. Index of refraction of glass plate with plane parallel faces.
48. Focal length of a convex lens.
49 Construction and magnifying power of (1) a telescope, (2) a microscope.

Alternative.

1. Comparison of resistances, Carey—Foster Method, Tory and Pitcher, p. 209.)
2. Measurement of small resistances (T. & P p. 221.)
3. Measurement of large resistances (T. & P., p. 225.)
4 Determination of resistance of a D'Arsonal Galvanometer by shunting. (T & P., p 243.)
5 Determination of constant of a D'Arsonval galvanometer. (T & P, p. 247.)
6 The absolute capacity of a condenser, Ballistic galvanometer. (T & P., p. 270.)
7 Comparison of condensers (T. & P., p. 278.)
8. Determination of the magnetic elements by the earth inductor.
9. Comparison of two coefficients of self-induction.
10. The magnetic permeability of iron

A course in surveying is in preparation, and it is hoped that greater uniformity can be secured in all courses in the near future.

Engineering Camp.

A united engineering camp for students between the second and third and the third and fourth years, will be held in some place to be selected in Nova Scotia, September 2nd to 21st, 1912. There will be required a deposit of eighteen dollars ($18) for this class.

Short Courses.

The Technical College is offering two special short courses this year, viz.: (1) Short Course in Land Surveying. (2) Short Course in Highway Construction.

A detailed description of these courses will be found on page .

The course for land surveyors is intended to qualify men to hold positions as land surveyors under the new regulations passed by the Legislature in 1909-1910. Anyone who successfully passes the course and who has had practical experience as set forth in the said Act is given a certificate as a duly qualified land surveyor.

The course in highway construction is designed for those who are engaged in the construction of rural highways. This is a practical course. It is the aim to leave theory in the background as much as possible, and to consider for the most past the practical side of road building, which concerns every farmer, town officer, and especially every road superintendent and inspector.

Next year it is planned to offer more short courses for stationary and marine engineers, power plant superintendents, colliery officials, etc., if the short course idea meets with approval and success.

Equipment.

A great deal of time and thought has been spent on the equipment for the various laboratories to select a good thorough up-to-date assembly of apparatus for teaching purposes. The apparatus as far as it has been purchased already, is given below.

Civil Engineering.

Surveying Instruments.—1 Queen transit, 2 Gurley transits, 1 Buff and Buff transit, 1 Keuffel and Esser mining transit, 1 Ainsworth transit, 1 Buff and Buff triangulation theodolite, 1 Buff and Buff Wye level, 2 Gurley levels, 1 Buff and Buff Dumpy level, 1 Stanley level, 1 Keuffel and Esser level.

Testing Machines.—One hundred thousand pounds' capacity testing machine, extensometer for tension and compression, improved deflection instrument, improved dial deformeter, Gilmour needle, Briquette moulds, Le Chatelier specific gravity apparatus, Olsen's compression micrometer, encased abrasion cylinder, 2,000 lbs. traction dynamometer, 50,000 lbs. hydraulic compression testing machine, transverse tester of 10,000 lbs. capacity, 60,000 inch-pound torsion testing nachine.

Electrical Engineering.

1 Canadian General Electric Co. 50 K. W., D. C., 3 wire 220 V. generator; 1 Canadian General Electric Co. Edison tripolar, D. C. generator, 125 V., 25 K. W., 1 Matheson return tubular boiler for 125 lbs.; 1 Westinghouse 60 cell storage battery; 1 Fairbanks 4 H. P. special electric gasolene engine; 1 Crosby 6 inch steam test gage; 1 Elliott Bros. speed indicator; 2 Esterline dynamometers; 2 Shuchardt & Schutte initiative revolution counters; 1 Schuchardt & Schutte No. 4 tachometer;

1 Schaeffer 10″ 330 lbs. test gage; 1 Schaeffer siphon pressure gage; 1 Schaeffer 7″ pyrometer; 1 Washburn variable speed drill; 1 Bertram 28″ radial drill; 1 Oster hand pipe-threading machine; 1 Pratt & Whitney 14″x6″ engine lathe; 1 Gen. Elec. 5 H. P., 220 V., A. C. induction motor; 2 Gen. Elec. 5 H. P., 220 V. A. C. electric motor; 4 Gen. Elec. shunt wound electric motors; 2 Gen. Elec. 10 H. P., 250 V., D. C. electric motors; 1-2½ K. W., D. C. electric generator; 1-¼-H. P. single phase electric motor; 1-½-H. P. single phase electric motor; 2-5-H. P. induction motors; 25 H.-P. compound wound motors; 1 Lincoln variable speed motor; 4-½ H. P. shunt wound D. C. electric motors; 1 United Wireless rotary converter; 1 Westinghouse 7½ K. W. rotary converter; 1 Pocket Battery voltmeter, 0-3 volts; 1 Bristol recording voltmeter; 1 portable Victor combination meter; 16 Westinghouse carbon break circuit breakers; 2 Westinghouse type "R" portable ammeters; 1 Westinghouse type "C" 10 amp. integrating wattmeter; 3 Pittsburgh 5 H. P. high efficiency electric transformers; 1 Elliott Bros. Ewing's hysteresis meter; 1 Elliot Bros. Harrison universal photometer; 1 Elliot Bros. leakage indicator; 2 Esterline 446 volt transformers; 1 Leeds & Northrup galvanometer; 2 Leeds & Northrup condensers; 1 Leeds & Northrup galvanometer, type "P"; 1 Leeds & Northrup galvanometer, type "H"; 1 Leeds & Northrup condenser; 1 Leeds & Northrup potentiometer; 1 Leeds & Northrup stationery photometer; 1 Leeds & Northrup electric dynamometer; 1 Leeds & Northrup electric temperature indicator; 1 Leeds & Northrup Kelvin galvanometer; 1 United Wireless step-up transformer; 1 Weston multimeter testing set; 2 Weston D. C. voltmeters; 1 Weston millammeter; 4 Weston voltmeters; 2 portable wattmeters; 2 D. C. ammeters; 1 Weston D. C. voltmeter; 4 Weston switchboard ammeters; 4 Weston switchboard voltmeters; 1 Weston lab. std. milli-voltmeter; 1 Weston electric tachometer; 1 Paul reversible meter bridge; 1 Paul meter Carey-Foster bridge; 1 set Biddle variable resistances; 1 Elliot Bros. electric testing set; 1 Elliot Bros. railbond test set; 1 Griffin electric test set;

1 Sun Ray electric arc lamp; 2 Pringle electric arc lamps; 2 Canadian Westinghouse arc lamps; 1 Excello electric arc lamp; 1 German-American electric arc lamp; 2 Stillwell-Vandemark electric arc lamps with accessories; 2 Gen. Elec. flaming arc lamps; 1 automatic adding machine; 1 mercury arc electric blue printing machine; 1 Machado and Roller frequency meter; 1 Can. Gen. Elec. Co. mercury arc rectifier; 1 Hopkins electric speedometer.

Mechanical Engineering.

The equipment of the laboratory includes:

(a) *Steam Engines.*— One cross-compound non-releasing Corliss automatic cut-off engine, with cylinders 12″ and 20″ by 20 stroke, having special adjustments on governor and valve gear for laboratory experimental purposes, built by the Robb Engineering Company, of Amherst, N. S. The space can be varied over a considerable range by these adjustments, and the engine is designed for a normal load of 150 H. P. non-condensing to about 220 H. P., condensing, at 180 R. P. M. There are two pulleys for taking off power by belt, and one side has an extension and outboard bearing with flange coupling for direct connection to dynometer or other load. In addition the main pulley, which serves also as fly wheel, is equipped with a water-cooled brake of ample capaciey to absorb full power developed by the engine.

One automatic cut-off high speed engine of 75 B. H. P., also made by the Robb Engine Company. The cylinder is 10″ x 12″, 250 R. P. M. It is direct connected to a generator, and facilities are offered for combined boiler engine and generator tests.

One 10 H. P. Engine, cylinder 6″ x 10″, with facilities for valve setting.

One vertical 8 H. P. Engine, manufactured by I. Matheson and Co., of New Glasgow, N. S.

One Kerr Steam Turbine, 20 B. H. P. at 3600 R. P. M.

Boilers.—Two horizontal return tubular boilers of 80 H. P. each, manufactured by I. Matheson and Co. They furnish steam to the laboratories and the heating system of the main building. They are supplied with both pumps and injectors. Weighing tanks, draft and pressure gauges, etc., are provided for carrying on evaporative tests.

Gas Engines.—One Crossley Oil Engine of 4 I. H. P. It is of the boat tube ignition type, and may be run with various fuels.

One Fairbanks Morse 4 I. H. P. horizontal gas engine

Miscellaneous.—One Canada Foundry Cochrane 150 H. P. feed water heater.

Pumps: 1 McDougall duplex steam pump, 10″x6″x10″. 1 Blake pump; 1 turbine pump, motor driven; 2 centrifugal pumps;

Calorimeters.—Boys' standard gas calorimeter, with pressure regulator and meter.

Parr calorimeter for determination of the calorific value of coal. Total carbon apparatus for making the proximate analysis of coal. Ellison's throttling-evaporating calorimeter for obtaining dryness of steam. Carpenter's separating calorimeter. Barrel calorimeter. Calorimeter for tests on saturated steam. Apparatus for determining the heat loss from steam pipes, with various types of lagging, and heat loss from radiators. One small air compressor, with orifice box for the determination of the flow of air. 1 Hay's flue gas analysis apparatus complete, with gas sampler.

1 Crosby gauge tester. 1 Engler viscometer. 1 Venturi meter tube, with manometer. 1 Pelton water wheel. 1 weir, fitted for experimental work. 1 hydraulic

ram, working against various heads. 2 large pressure tanks, used in connection with the calibration of orificis and various tests in hydraulics.

The smaller apparatus belonging to the laboratory consists of weighing machines, brakes, indicators for steam and gas engines, speed counters, thermometers, gauges and planimeters.

Mining Engineering.

See pp. 5 *et seq.*

Department of Electrical Engineering.

As announced elsewhere, the first two years of this course are given in the affiliated colleges. The course as herein described covers the third and fourth years. The plan is to give a broad and thorough training in the theory and practice of electricity and mechanical principles, and their application to engineering work.

The laboratories are well supplied with engineering instruments suited to the requirements of the course.

In addition to the electrical laboratories of the main building, a special power laboratory building is provided, in which are located the steam plant which heats the College, a 50 Kilowatt Electric Generator, besides equipment of smaller steam and gas engines for experimental work. In this building are also located the materials testing and hydraulic laboratory and a small machine shop. The engineering laboratory building is 160 by 40 feet.

The students taking this course should have a sound theoretical knowledge of mathematics, chemistry, physics and applied mechanics. The theoretical work runs parallel

with a course in the laboratories, which extends through the third and fourth years. The laboratory work is carried on with the purpose of developing in the student habits of accurate observation, and of bringing to his consideration not only methods and tests of fundamental importance, but questions of economy of time and precision of results.

201-202. Electrical Machinery.

Third Year, First and Second Semester, Three Hours a Week.

This is a course of three recitations per week. Topics considered are: History of the development of dynamo electric machinery; definitions of dynamo, motor, magnetic field, magneto-motive force, hysteresis, etc.; materials used by the electrical engineer; parts of the dynamo and the general consideration of circuits, transformers, motor-generators; constant and variable currents, and the general effect on an electric circuit of a variable current; theory and characteristics of direct current generators and motors, including series, shunt and compound wound machines; the theory of computation, speed control of motors, and a discussion of the principles of testing electric machinery.

Reference:

Norris:—"Elements of Electrical Engineering."

Sheldon:—"Dynamo Electric Machinery."

S. P. Thompson:—"Dynamo Electric Machinery."

J. A. Ewing:—"Magnetic Induction of Iron and other Metals."

Reid:—"Elementary Electrical Engineering."

Crocker:—"Electric Lighting," Vols. I and II.

Franklin and Esty:—"Elements of Electrical Engineering."

201A-202A.—Electrical Machinery. An abbreviation of 201-202 for students in Civil and Mining Courses.

203-204. Alternating Currents and Machinery.

Fourth Year, First and Second Semesters, Three Hours a Week.

This course is a continuation of 201-202 and deals more at length with the mechanical theory of alternating current phenomena. It deals with the sine wave in its application to electric circuits, applications in detail to various types of systems, containing impedances in series and parallel, measurements of all power in single phase and polyphase circuits and elementary theory of the transformer.

Reference:

Steinmetz:—"Alternating Current Phenomena."

Weingreen:—"Electric Power Plant Engineering."

Franklin and Esty:—"Elementary Electrical Engineering Atlernating Currents."

Steinmetz:—"Electrical Engineering."

205, 206, 207, 208. Electrical Engineering Abstracts.

Third and Fourth Years, First and Second Semesters, one Hour per Week.

The students meet once a week for an hour to discuss current magazines, bulletins from manufacturers, proceedings of the Engineering Societies, late inventions and items of general interest to the Engineer.

Reports on various assigned topics will be required.

209-210. Electrical Distribution.

For Mechanical and Electrical Engineers, Fourth Year, Three Hours Credit. Three Hours per Week, Second Semester.

This course deals with the transmission of power by means of electrical energy; fundamental problems in transmission line design; conditions effecting choice of apparatus; line voltage, etc. A study will be made of certain leading transmission systems which are at present in operation, with a view of ascertaining the reasons for selecting such apparatus, and the effect on the result had another system been chosen.

Reference.

Weingreen:—"Electric Power Plant Engineering."
McGraw-Hill:—"Standard Handbook for Electrical Engineers."
Thompson:—"Dynamo Electric Machinery."
Lyndon:—"Development and Electrical Distribution of Water Power."
Hobart:—"Heavy Electrical Engineering.

211. Electric Railways.

Fourth Year, Electrical Engineers, Second Semester, Last Six Weeks, Five Hours, a Week, Two Hours Credit.

Study of conditions effecting choice of apparatus; power requirements, car and car equipments, track construction, bonding, testing, and distributing systems.

This course is intended to give the student a thorough knowledge of the principles of electric railway engineering. A study will be made of acceleration, tractive force and power required, power generation, transmission, distribution, electric locomotives and their electrical equipment.

Reference.

Parshall and Hobart:—"Electric Railway Engineering"

McGraw-Hill:—"Standard Handbook for Electrical Engineers."

Bell:—"Electric Distribution for Electric Railways."

Gozenbock:—"Engineering Preliminaries for an Interurban Electric Railway."

212. Electric Design Problems

Fourth Year, Second Semester, Last Eight Weeks, Six Hours per Week.

A course of laboratory and drafting to accompany No. 209-210. This course takes up the design of electrical machinery and equipment, as included in the thoeretical text book and lecture work in connection with the course. Various practical problems will be assigned during the year in connection with the course and the lecture room work. It is intended to give the student a knowledge of the application of the principles developed.

Reference.

Parshall and Hobart:—"Electric Machinery Design."

Norris and Dennison:—"A Course of Problems."

213. Electrical Machinery.

Mining Engineers, First Semester, Three Hours per Week.

This is a special course in Electrical Machinery for students not specializing in Electrical Engineering. It is designed to give the student a general knowledge of the design, construction and operation of electric dynamos,

motors, transformers, and measuring instruments of various types and makes. In the accompanying laboratory course, the student is made familiar with the handling, operating and testing of electrical machinery.

Reference:

Rosenberg:—"Electrical Engineering."

Sheldon and Mason:—"Alternating Current Machinery

Franklin and Esty:—"Elements of Electrical Engineering."

214. Electrical Measurements and Photometry.

Electrical Engineers, Fourth Year, Second Semester, Three Hours' Credit, First Seven Weeks, Five Hours' Lecture and Recitation and Two Laboratory Periods.

This course deals with electric measuring instruments, their construction and sources of error. Practice is given in the calibration of measuring instruments. There is also a study made of and the performance of various types of arc, incandescent and vapor lamps and measurements made of their illuminating power.

Reference:

Wickenden:—"Illumination and Photometry."

Carhart and Patterson:—"Electrical Measurements."

Cravath and Lansingh:—"Practical Illumination."

Stine:—"Photometric Measurements."

Karapetoff:—"Experimental Electrical Engineering."

Steinmetz:—"Radiation, Light and Illumination."

250-251. Electrical Engineering Laboratory.

Third Year, First and Second Semester, one Three-hour Period a Week, Two Hours' Credit.

A series of experiments to accompany course No. 201-202. Its purpose is to illustrate the fundamental principles and to give the student practice in operating and testing electrical machinery. The first experiments are in the construction and use of electric measuring instruments followed by a study of methods and practice in testing motors, generators, covertors, motor-generators, constant current machines and arc incandescent lamps.

Reference:

Karapetoff:—"Laboratory Manual."

C. F. Smith:—"Testing of Dynamos and Motors."

Franklin and Esty:—"Dynamo Laboratory Manual."

Sever:—"Electric Engineering Experiments."

Sever and Townsend:—"Factory and Laboratory Tests in Electrical Engineering."

Swensen and Frankenfield: –"Testing of Electro-magnetic Machinery."

252-253. Electrical Engineering Laboratory.

Fourth Year, First and Second Semesters, One Three-Hour Period per Week, Two Hours' Credit.

A continuation of course No. 250-1, dealing with testing of electrical machinery, precise electrical measurements, standardization and photometry.

Ample equipment is provided for the determination of fundamental quantities.

Power is supplied from the Technical College Central Station and from a 200 ampere hour storage battery.

Opportunities for special investigations will be afforded to fourth year students.

Studies will be made of alternators, synchronous motors, induction motors, rotary converters and transformers.

References:

See No. 210.

215. Storage Battery Engineering.

Fourth Year, First Semester, First Nine Weeks, Five Hours per Week.

This course is designed to give the student a general knowledge of electro-chemistry and the principles of storage battery engineering.

The dissociation theory, ionization, electrolysis, primary and secondary cells are considered.

The formation of the plates, causes of deterioration, testing, maintenance and regulation of the lead storage battery.

Text:

Lyndon:—"Storage Battery Engineering."

References.

LeBlanc:—"Electro Chemistry."

McGraw-Hill:—"Standard Electrical Engineers' Handbook."

Foster:—"Electrical Engineers' Handbook."

270. Contracts and Specifications.

Fourth Year, Mechanical and Electrical Engineers, Second Semester, Ten Weeks, One Hour a Week.

This course is designed to give the student a general knowledge of preparing specifications and the law of contracts. Lectures on the subject by practising solicitors will be arranged during the course.

References:

Tucker:—"Engineering Contracts and Specifications."
Johnson:—"Contracts and Specifications."

301. Thermodynamics.

Third Year, First Semester, Fifteen Weeks, Five Hours per Week,

See Department of Mechanical Engineering, p. 38.

302. Steam Machinery.

Third Year, Second Semester, Fifteen Weeks, Two Lectures per Week.

See Department of Mechanical Engineering, p. 39.

303. Steam Power Plants.

Fourth Year, Mechanical and Electrical Engineers. First Semester, Six Weeks, Five Hours a Week, and Second Semester, Fifteen Weeks, Five Hours a Week.

See Department of Mechanical Engineering, p. 39.

350-351. Mechanical Engineering Laboratory.

Third Year, First and Second Semester, Fifteen Weeks, One Lecture and Three Hours Laboratory per Week.

See Department of Mechanical Engineering, p. 42.

Reference:

Carpenter:—"Experimental Engineering."

352-3. Mechanical Engineering Laboratory.

Fourth Year, First and Second Semester, Fifteen Weeks, Three Hours per Week.

See Department of Mechanical Engineering, p. 42.

References:

Carpenter:—"Experimental Engineering."

Flather:—"Dynamometers and the Measurement of Power."

329-330. Machine Design.

Third Year, First and Second Semesters, Two Hours per Week.

See Department of Mechanical Engineering, p. 43.

331-332. Machine Design and Drawing.

Third Year, First and Second Semesters, Six Hours per Week.

See Department of Mechanical Engineering, p. 44.

333-334. Machine Design and Drawing.

Fourth Year, Mechanical and Electrical Engineers, Two Lectures and Recitations Last Six Weeks, First Semester; First Seven Weeks, Second Semester, Continuing Course 330.

See Department of Mechanical Engineering, pp. 44, 45.

101. Mechanics of Engineering, I.

Third Year, First Semester, Fifteen Weeks, Five Hours per Week.

See Department of Civil Engineering, p. 47.

102. Mechanics of Engineering, II.

Third Year, First Nine Weeks of the Second Semester, Five Hours per Week.

See Department of Civil Engineering, p. 48.

103. Materials Testing.

Third Year, Second Semester, Fifteen Weeks, One Three-Hour Laboratory Period per Week. Concurrent With No. 102.

See Department of Civil Engineering. p. 48.

105. Structures I.

Third Year, Last Six Weeks of the Second Semester, Five Hours per Week.

See Department of Civil Engineering, p. 47.

111. Theoretical Hydraulics.

Third Year, First Nine Weeks of the Second Semester, Five Hours per Week.

See Department of Civil Engineering, p. 49.

112. Hydraulic Testing.

Third Year, Second Semester, Fifteen Weeks, One Three-Hour Period per Week.

See Department of Civil Engineering, p.—

428. Metallurgy of Iron and Steel.

Fourth Year, First Semester, Eight Week, Three Hours per Week

See Department of Mining Engineering.

III. Department of Mechanical Engineering.

This is a four years' course, the third and fourth of which are given in the Technical College, as outlined in the following schedule. It is designed to give the student a thorough knowledge of the basic principles of the design, construction, manufacture, and operation of machinery as used in manufacturing industries, power plants and power transmission as well as a general knowledge of executive management of the industries and plants.

Students who take the course should have a thorough training in mathematics, physics and shop work, and should have a natural aptitude for machinery, engines and tools.

All mechanical engineers require a good general knowledge of electricity, and all electrical engineers require training in mechanical principles. Therefore the two courses are similar throughout and identical in the third year. In the fourth year the student is given less of electrical machinery and goes deeper into the study and design and performance of machinery, steam and gas engines, and steam turbines. The mechanical laboratories are designed and equipped so as to give the student the necessary practice in the handling of machines and the testing and operation of engines. The equipment is thoroughly modern and adapted to illustrate the principles of the course as given in the class room.

In addition to the college laboratory practice, visits are made to the local power plants and manufacturing industries.

301. Thermodynamics.

Third Year, First Semester, Fifteen Weeks, Five Hours a Week.

This course in heat is considered one of the fundamentals of engineering and great stress is laid on the thorough mastery of its laws.

The elementary principles of heat and its effects are studied; the general laws of thermodynamics; theoretical heat engines, isothermal and adiabatic expansion.

References:

Ewing:—"Steam Engine."
Gebhardt:—"Steam Power Plant Engineering."
Benjamin:—"Heat and Steam."
French:—"The Steam Turbine."
Hutton:—"Steam Engines."
Stadola:—"Steam Turbine."
Peabody:—"Thermodynamics of Steam Enineering."
Ripper:—"Steam Engine."

301 A.—Thermodynamics. An abbreviated course based on 301 for students in Civil and Mining Courses.

302. Steam Machinery.

Third Year, Second Semester, Fifteen Weeks, Three Hours a Week.

This is a general course in mechanical engineering of power plants and prime movers.

Fuels and their heat value. Steam boilers and their auxiliaries. The steam engine and its accessories. The indicator, condensers, pumps, valves and valve gears, and governors. Laboratory instruction runs parallel with this course.

References:

See No. 301.

302 A.—Steam Machinery. An abbreviation of 302, corresponding to 301 A.

303-304. Steam Power Plants.

Fourth Year, Mechanical and Electrical Engineers, First Semester, Six Weeks, Five Hours a Week, and Second Semester, Fifteen Weeks, Five Hours a Week.

A general study of choice of types in power station equipment; the economics of efficiency versus cost; fixed and operating charges; local conditions relative to each case which govern in choice of machinery; the cost of power; the laying out of power plants under assumed working conditions; design, preparation of bill of materials, estimating the first cost; the influence of the cost of raw materials, fuel, water, labor, and load factor, on the design; preparation of contract and specification.

Text:

Meyer:—"Steam Power Plants."

References:

Gebhardt:—"Steam Power Plant Engineering."
Fernald:—"Prime Movers and Power Plants."
Hutton:—"Mechanical Engineering of Power Plants."
Jones:—"Gas Engine."
Carpenter and Diedrichs:—"Gas Engine."

305. Steam Turbines.

Fourth Year, First Semester, Mechanical Engineers, Six Weeks, Five Hours per Week.

A study of the types of turbines and the theory of their performance, the flow of steam and its action on the curved surface of the buckets, efficiency of turbines and their utility in general as compared with other forms of steam engine.

Text and Reference:

Stadola:—"The Steam Turbine."

306. Gas Engines.

Fourth Year, First Semester, Mechanical Engineers, First Nine Weeks, Five Hours per Week.

Gas engine types and points to be considered in making selection, small gas and gasoline engines, stationery and marine larger producer gas engines, their design and operation, including methods of starting, ignition and sources of trouble; gas producers, their design, operation and efficiency.

Reference:

Haeder and Huskisson:—"Handbook of the Gas Engine."

Lucke:—"Gas Engine Design."

Carpenter and Diedrichs:—"Gas Engines."

Jones:—"Gas Engine."

Robinson:—"Gas and Oil Engines."

307-308. Mechanical Engineering Abstracts.

Fourth Year, First Semester, Fifteen Weeks, One Hour per Week.

This is a course dealing with current engineering problems. Topics will be assigned and reports required based on discussions in current engineering magazines, which will be on file in the library of the college.

309. Steam Boilers.

Fourth Year, Mechanical Engineers, Second Semester, Last Six Weeks, Five Hours per Week.

The design and construction of steam boilers; horizontal return tubular boiler, the shell, tubes, and methods of riveting and staying; water tube boilers, horizontal and vertical; a study of the relative merits of the various types.

References:

Parsons:—"The Steam Boiler."

Peabody and Miller:—"The Steam Boiler."

Gebhardt:—"Steam Power Plant Engineering."

Kent:—"Steam Boiler Economy."

350-351. Mechanical Engineering Laboratory.

Third Year, First and Second Semester, Fifteen Weeks, Three Hours a Week.

A course of testing indicators and gauges, steam, gas and gasoline engines; dynamometers and the measurement of power, pyrometers and the measurement of heat; Calorimeters, for steam and gas; pumping machinery and hydraulic metors.

Reference:

Carpenter:—"Experimental Engineering."

352-353. Mechanical Engineering Laboratory.

Fourth Year, First and Second Semester, Fifteen Weeks, Three Hours a Week.

A continuation of course No. 350-1, which deals with the more difficult problems of efficiency tests, power plant and commercial tests. Visits will be made to local plants and in some cases arrangements may be made to conduct tests under the direction of the college officials.

References:

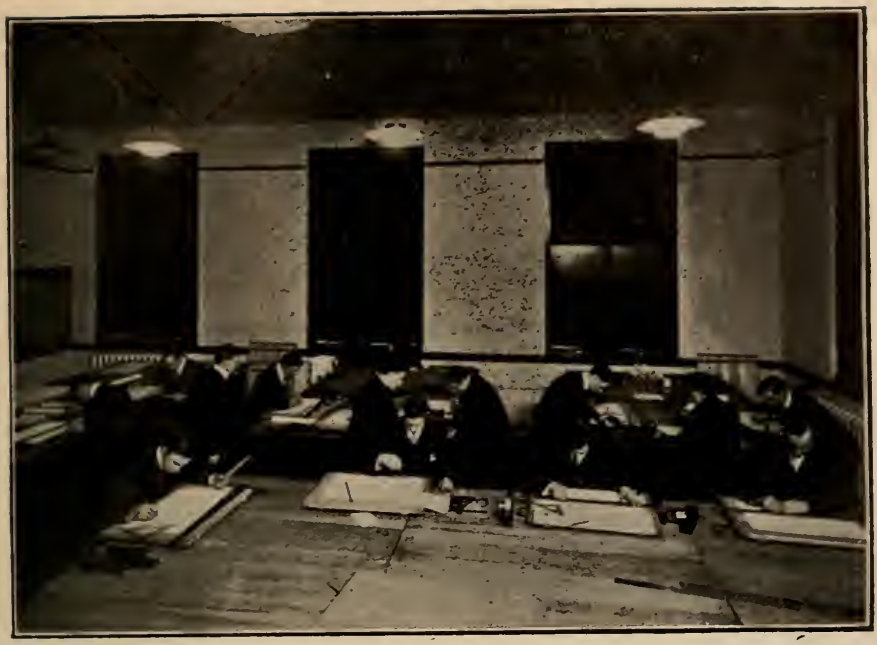
Carpenter:—"Experimental Engineering."

Flather:—"Dynamometers and Measurement of Power.

322. Heating and Ventilating.

Fourth Year, First Semester, Mechanical Engineers, First Nine Weeks, Five Hours per Week.

This course of lectures and recitations is planned to acquaint the student with the fundamental principles of the subject and the proper application of the principles to practice in the solution of heating and ventilating pro-



Drafting Room.

Interior of Mechanical Engineering Laboratory.

blems. The course considers quantity of air required; direct and indirect, steam, hot water and hot air systems; size of ducts, radiators, and total heating surface required, design of heating plants and selection of equipment; humidity and temperature control.

References:

Carpenter:—"Heating and Ventilating."
Baldwin:—"Heating and Ventilating."

329-330. Machine Design.

Third Year, First and Second Semesters, Fifteen Weeks, Two Hours per Week.

Concurrent with 331 and 332. This is the recitation and lecture part of the designing of machinery, and the first semester's work covers the empirical and rational proportioning of the simpler parts of familiar machines, such as bolts and other screwed fastenings, keys, cotters, link and belt drives, shaft couplings and clutches, strength of gear teeth, and other machine parts subject to simple stresses. As the work advances, more difficult pieces are taken up, as shafting and rods subject to two or more stresses of difficult natures acting alternately or simultaneously, and modifications of simple parts or complete machines necessitated by shop systems, legal requirements, future location of machine, economy of output, convenience of transportation, etc. Instruction is also given on drafting room system, care of notes and data, use of standards, tables and the slide-rule and the preparation and preservation of calculations and preliminary sketches. A thorough knowledge of kinematics, elementary and applied mechanics, trigonometry and elementary mathematics is essential to all students taking up work in machine design.

Text:

Spooner:—"Machine Design, Construction and Drawing."

References:

Smith and Marx:—"Machine Design."

Unwin:—"Machine Design."

Dunkerly:—"Mechanism."

331-332. Machine Design and Drawing.

Third Year, First and Second Semesters, Six Hours, per Week.

This course covers the drafting-room work of which the theoretical principles are covered in 330. A part of the student's time is devoted to making drawings in detail and assembly of actual machines which are first measured and sketched free-hand, and then drawn to scale on the board and traced. Later, the detail and assembly drawings are made of simple machines, every part of which is designed in accordance with the theory of machine design and taken up in course 330. As every good machine designer depends as much upon his intuition sense of proportion as he does upon formula and calculation, the work in the drafting-room is so arranged that the student must use his common sense and experience quite as much as his mathematics and mechanics, and his drawings, tracings and blue prints must conform to accepted standards and proportions.

333. Machine Design and Drawing.

Fourth Year, Mechanical Engineers, First Semester, Fifteen Weeks, Six Hours per Week.

Design of cams and gear teeth, details of standard machinery, belt and pulley transmission, pipes and pipe joints and engine details.

Text and References:

Benjamin:—"Machine Design."
Spooner:—"Machine Design."
Reid:—"Machine Design."
Unwin:—"Machine Design."
Anthony:—"Essentials of Gearing."

334. Machine Design and Drawing.

Fourth Year, Mechanical and Electrical Engineers, Second Semester, Fifteen Weeks, Six Hours per Week.

A continuation of No. 333, dealing with more difficult problems in the design of steam engines, gas engines and machine tools.

336. Design Problems.

Fourth Year, Mechanical Engineers, Second Semester, Fifteen Weeks, Two Hours per Week.

A course of problems as assigned in design along lines in which the student expects to specialize.

201-202. Electrical Machinery.

Mechanical and Electrical Engineers, First and Second Semester.

See Department of Electrical Engineering, p. 27.

205. Electrical Engineering Abstracts.

Third and Fourth Years, First and Second Semester.

See Department of Electrical Engineering, p. 28.

The students meet once a week for one hour to discuss current magazines, bulletins from manufacturers, proceedings of the engineering cosieties, late inventions and items of general interest to the engineer.

209-210. Electric Distribution.

Mechanical and Electrical Engineers, Fourth Year, First and Second Semester.

See Department of Electrical Engineering, p. 29.

250-251. Electrical Engineering Laboratory.

Third Year, First and Second Semester.

See Department of Electrical Engineering, p. 32.

252-253. Electrical Engineering Laboratory.

Fourth Year, First and Second Semester.

See Department of Electrical Engineering, p. 32.

220. Contracts and Specifications.

Mechanical and Electrical Engineers, Fourth Year, Second Semester, Fifteen Weeks, One Hour per Week.

This course is designed to give the student a general knowledge of preparing specifications and the law of contracts. Lectures on the subject of liens, contracts, mining regulations, employers liability, etc., are given by the lecturer. Lectures on specifications, etc., are given by the professor in the various departments to the students in each department.

101. MECHANICS OF ENGINEERING, I., See p. 47.
102. MECHANICS OF ENGINEERING, II., See p. 48.
103. MATERIALS TESTING, See p. 48.
111. THEORETICAL HYDRAULICS, See p. 49.
112. HYDRAULIC LABORATORY, See p. 49.
428. METALLURGY OF IRON AND STEEL, See p.—

Department of Civil Engineering.

The course in Civil Engineering covers two years of prescribed studies, designed to provide a thorough foundation in the fundamental principles involved in all engineering practice. Students entering this course should be well prepared in physics, mathematics (including calculus) elementary surveying and in mechanical drawing and descriptive geometry.

Instruction is given by means of lectures and recitations and by practice in the laboratory, the drawing-room and the field. It is the aim to cover thoroughly the subjects taught rather than to take up in a superficial manner the whole field of Civil Engineering subjects. Problems are made as practical as possible and the student is encouraged to depend upon himself in their solution rather than to follow rule-of-thumb methods.

101. Mechanics of Engineering I.

Third Year, First Semester, Fifteen Weeks, Five Hours per Week.

This course comprises a study of the fundamental principles of statics and dynamics, and involves the application of these principles to the solution of numerous

problems both in and out of class. Both analytical and graphic methods are employed. Special stress is laid upon those principles most used by engineers.

Text.

Wright:—"Elements of Mechanics."

102. Mechanics of Engineering II.

Third Year, First Nine Weeks of the Second Semester, Five Hours per Week.

This course comprises a mathematical study of the strength of materials, including stresses and strains in bars subjected to tension, compression, and shearing; the common theory of beams; columns; torsion; resilience.

Text.

Boyd:—"Strength of Materials."

103. Materials Testing.

Third Year, Second Semester, Fifteen Weeks, one Three-Hour Laboratory Period per Week.

This course comprises a series of tests of the strength and elasticity of wood, cast iron, and steel and runs concurrently with No. 102.

105. Structures I.

Third Year, Last Six Weeks of the Second Semester, Five Hours per Week.

This course is designed as an introduction to the study of structures as taught in the fourth year. It comprises a study of outer and inner forces, reactions, shears, moments, influence lines, concentrated load systems, and the design of beams.

Text.

Spofford:—" 'Theory of Structures."

111. Theoretical Hydraulics.

Fourth Year, First Semester, Fifteen Weeks, Three Hours per Week.

This is a course of 45 exercises in the first Semester of the fourth year and deals with the theory of water pressure and the flow of water through orifices, tubes, pipes, canals and rivers, discharge over weirs, and losses due to friction and other causes.

Text.

Russell:—"Hydraulics."

112. Hydraulic Laboratory.

Fourth Year, First Semester, Fifteen Weeks, Three Hours per Week.

This course runs concurrently with No. 111 and includes a series of experiments for determining the discharge of orifices, nozzles and weirs under varying conditions, and a determination of the coefficients involved. Determination of losses in pipes due to friction and other causes. Measurements with the Venturi meter. Efficiency tests on the ram, turbine, Pelton wheel, etc.

Students make written reports involving computations, plotted curves, etc., based upon the data collected.

119. Advanced Surveying.

Third Year, First Semester, Fifteen Weeks, Four Hours per Week.

Lectures, field, and drafting room work covering the following: The use of stadia and plane table in topographic work. Precise, barometric and trigonometric levelling. The mapping of surveys made at the previous Summer Camp will be completed.

120. Advanced Surveying.

Third Year, Second Semester, Fifteen Weeks, Five Hours per Week.

The principles of practical astronomy and the determination of latitude, longitude, azimuth and time with ordinary surveying instruments. Photographic surveying. The relation of geology to topography. Hydrographic surveying and stream gaging.

The drafting room work will include a problem in the paper location of a line of railroad.

Text.

Breed and Hosmer:—"The Principles and Practise of Surveying," Vol. II.

121. Railroad Engineering I.

Third Year, First Semester, Fifteen Weeks, Four Hours per Week.

This course comprises a study of the mathematics of curves, as used in railroad work; the easement curve; methods of staking out and computating earth work. Numerous problems for outside solution are given, and the practical application of problems studied is constantly emphasized.

Text.

Allen:—"Railroad Curves and Earthwork."

122. Railroad Engineering II.

Third Year, Second Semester, Fifteen Weeks, Three Hours per Week.

This is a course devoted to a study of maintenance of way; signalling; train resistances; the influence of grades, distance, curvature, rise and fall; yards and terminals.

Text:

Raymond—"Railroad Engineering," Vol. II.

123. Summer School of Surveying.

Three weeks of field work in camp in September preceding each of the third and fourth years. The camp is held in a different part of the Province each year.

The object of this course is to give students more extended field practice than is possible during the regular college year. It is the intention that each student shall be given practice with all the instruments used.

The work consists of topographic work, with transit, stadia and plane table, and stream measurements, with floats and current meters. A complete survey for a short line of railroad is made. Each student is required to keep full sets of notes from which the surveys are plotted, and estimates made as the work proceeds.

124. Railroad Design.

Fourth Year, First Semester, Fifteen Weeks, Three Hours per Week.

A drawing room course of 45 hours in the First Semester of the fourth year, involving the application of the principles covered in courses 121 and 122, to problems in trackwork, yards, etc.

131. Highway Engineering.

Third Year, Second Semester, Ten Weeks, Two Hours per Week.

A course of 20 lectures during the second Semester of the third year. It comprises a study of the principles pertaining to the location, construction, and maintenance of roads and the construction and maintenance of the various pavements used for city streets.

Text.

Baker:—"Roads and Pavements."

141. Masonry Construction.

Fourth Year, First Semester, Fifteen Weeks, Two Hours per Week.

The course is devoted to the study of the materials used in masonry work and to the methods of construction of foundations for bridges, buildings, and other structures.

Text.

Baker:—"Masonry Construction."

142. Materials Testing.

Fourth Year, First Semester, Fifteen Weeks, Five Hours per Week.

This course accompanies 141. The work consists principally of tests of cements and plain and reinforced concrete. Tension, compression and transverse tests, with varying conditions, materials and combinations. Tests of beams, slabs, columns and arches.

151. Water Supply.

Fourth Year, Second Semester, Fifteen Weeks, Three Hours per Week.

The course is devoted to a study of municipal water supply systems, their design and construction. Quality of water, examination, tests and methods of purification. sedimentation, filtration, etc. Source, quantity, rainfall, evaporation, percolation, storage, reservoirs, ground flow. Wells, pumps, and pumping machinery.

Stand-pipes, water towers, conduits, distribution systems. A study of the quantity required per capita and the variations with diverse conditions. Methods and cost of construction, maintenance, and operation.

Text.

Turneaure and Russell:—"Public Water Supplies."

152. Hydraulic Design.

Fourth Year, Second Semester, Fifteen Weeks, Two Hours per Week.

A drawing room course devoted to the design of structures connected with water supply.

153. Hydraulic Engineering.

Fourth Year, Second Semester, Fifteen Weeks, Three Hours per Week.

The time is given over to consideration of hydraulic developments for purposes of power or irrigation and to details and construction of hydraulic machinery.

Text.

Mead:—"Water Power Engineering."

162. Sewerage and Sewage Disposal.

Fourth Year, Second Semester, Fifteen Weeks, Three Hours per Week.

A course devoted to the study of various systems for the removal of sewage; the quantity and character of sewage; effect of rainfall; size and form of sewers; methods of sewage disposal; cost and methods of construction.

Texts

Folwell:—"Sewerage."

Kinnicutt, Winslow, and Pratt:—"Sewage Disposal."

163. Sewer Design.

Fourth Year, Second Semester, Fifteen Weeks. Three Hours per Week.

A drawing room course devoted to the design of part of a sewerage system for a city.

174. Structures II.

Fourth Year, First Semester, Fifteen Weeks, Three Hours per Week.

This course is a continuation of course 105 and is devoted to the computation and design of structures of wood and steel. The subjects trated are plate-girders, and various roof and bridge trusses,

Text.

Spofford:—"Theory of Structures."

175. Structures III.

Fourth Year, Second Semester, Fifteen Weeks Three Hours per Week.

A continuation of Course 174, including also a study of retaining walls, masonry dams, arches, and reinforced concrete.

Texts.

Spofford:—" Theory of Structures."

Turneaure and Maurer:—"Principles of Reinforced Concrete Construction."

176. Structural Design I.

Fourth Year, First Semester, Fifteen Weeks, Nine Hours per Week,

A drawing room course in which students apply the peinciples studied in Course 174 to problems in design.

177. Structural Design II.

Fourth Year, Second Semester, Fifteen Weeks, Nine Hours per Week.

A continuation of Course 176. The work covered in the two courses usually consists of the design of a wooden truss, a plate girder, a riveted or pin-connected truss, and several smaller designs in concrete.

191. Contracts.

A course of ten lectures on the law of contracts by Mr. Justice W. B. Wallace, given during the second semester of the fourth year, and supplemented by five lectures on specifications by the department.

IV. Department of Mining Engineering.

400-401. Quantitative Analysis.

Third Year, First and Second Semesters, Fifteen Weeks, Nine Hours a Week.

The aim of this course is to acquaint the student with the theory and practice of representative methods of gravimetric and volumetric quantitative analysis. A high standard of accuracy is required in most of the work so that the student may be qualified to make analyses of the refinement demanded in umpire work. Toward the end of the course, the student is familiarized with some common commercial methods for analyzing ores, slags, and metallurgical products, and is required to make a certain number of determinations within a time limit.

Reports must be written up to date, and handed in at the end of every week, otherwise full value for the work cannot be obtained. Each student is required to make a deposit of $5.00 at the opening of the session to cover breakage during the year.

The following analyses are included in the course and are supplemented with extra work according to the rapidity with which each individual accomplishes the tasks:

Water, sulphur, and magnesia in crystallized magnesium sulphate; iron, gravimetrically, in ferrous ammonium alum; silica, iron and alumina, calcium and magnesium in limestone or dolomite; lead, copper, and zinc in brass; preparation of normal solutions; alkalinity of soda ash, acid strength of oxalic acid, iron in ore by bichromate and permanganate methods; silica, sulphur, phosphorus, iron in iron ore; carbon, sulphur, silicon, manganese and phosphorus in steel and pig iron; zinc, copper, lead, antimony, tungsten and arsenic in ores; tin in bearing metal; slag analysis, flue gas analysis; sulphur in coal, proximate analysis of coal, calorific power of coal.

Texts:

Miller:—"Quantitative Analysis for Mining Engineers."

Talbot:—"Quantitative Analysis."

Blair:—"Chemical Analysis of Iron."

Low:—"Technical Methods of Ore Analysis."

402. Quantitative Analysis.

Third Year, Fifteen Weeks, Two Hours a Week in First Semester, and One Hour in the Second Semester.

This is a course of lectures to accompany courses 400-401. It covers the work done in the Laboratory and includes discussions of quantitative separations from a theoretical standpoint, as well as chemical calculations and a short course in Elementary Physical Chemistry.

Text.

Talbot and Blanchard:—"Electrolytic Dissociation Theory."

403-404. Metallurgical Laboratory.

Fourth Year, First and Second Semester, Fifteen Weeks, Eight Hours a Week.

This consists of metallurgical and mill tests and reports. Some of the tests are merely illustrative of processes, and some are made with half-size regular furnaces and mill apparatus. Full reports are required, in every case, within two weeks after the completion of an experiment or test. A large amount of assaying is necessary in determining the distribution of values and losses in the products made in the different tests, and this makes the student more proficient as an assayer.

Most of the following tests are carried out by the students in the fourth year:

High temperature measurements. Determination of the calorific power of fuels. Temperature limits of hardening power of steel. Oxidizing roast of a sulphide ore. Melting points of silicates. Corrosion of refractories by silicates. Copper selecting process. Chloridizing roast, barrel chlorination process. Cyanide process, leaching and slime treatment. Gold amalgamation test. Silver pan amalgamation. Lead or copper smelting in the blast furnace. Cupellation of base bullion. Refining of copper. Gold stamp mill run. Concentration by jigging with previous sizing and with classification. Wilfley table concentration. Vanner concentration.

405. Structural and Applied Geology.

Third Year, First Semester, Fifteen Weeks, Two Hours per Week. Field Work, One Week in the Summer School of Mining.

The lecture course deals with structural geology with respect to its effect on ore deposits. The principles of structural dynamical and chemical geology, practically

applied to economic advantage in finding and exploring ore bodies. Estimating the dip and strike of rocks, study of faults, folds, joints, etc., their relation to ore deposits and effects on previously formed ore bodies; careful study of the functions of fault movement; effects of glacial action; study of the various kinds of placer deposits; study of ore concentration by underground waters; secondary enrichment, metamorphism; processes of ore deposition and concentration; arrangement of stratified rocks, their origin and characterisitcs; study of igneous rocks, classification and physical characters.

Field Work.

The field work is individual. The student will be required to make a careful study of some special portion of a quadrangle assigned to him, and to observe faults, folds, erosion, weathering, glacial phenomena, igneous and sedimentary rocks; cleavage, jointing, etc., making careful notes of all the dips and strikes. A full and accurate geological map, with cross sections, will be required, also a short report on the work. The map will show the geological distribution and boundaries, the location of all important outcrops and structural features.

Texts.

Spurr:—"Geology Applied to Mining."

Geikie:—"Structural Geology."

406. Mineralogy.

Third Year, Second Semester, Fifteen Weeks, Five Hours per Week.

This course includes descriptive and determinative mineralogy.

The time will be largely given to laboratory work in order to train the student to determine minerals accurately and rapidly by their physical and chemical properties, to

make him thoroughly acquainted with the appearance, properties, uses and association of the more important mineral species.

The determinative mineralogy begins with drill in the methods of blow-pipe analysis with a view to preparing the student for the practical determination of the more important ore making minerals.

This is followed by determinative mineralogy proper.

Texts.

Moses and Parsons:—"Crystallography, Mineralogy, and Blow-pipe Analysis."

Butler:—"Hand-book of Minerals."

References:

Brush and Penfield:—"Manual of Determinative Min eralogy and Blow-pipe Analysis."

Dana:—"Textbook of Mineralogy."

407. Economic Geology.

Fourth Year, First Semester, Fifteen Weeks, Two Hours per Week.

For students in the Mining and Civil Engineering Courses.

The non-metallic minerals; the distribution and modes of occurrence of coal, petroleum, natural gas, asphalt, building stones, clay, lime and calcareous cements, gypsum, salines, fertilizers, abrasives, minor minerals, water supply, soil, and road materials; their properties, sources and uses will be studied as much in detail as possible in the time available. Especial attention is given to the study of the Nova Scotia coal fields and to the other non-metallic mineral resources of the province.

Texts:

Ries:—"Economic Geology of the United States."

Young:—"Geology and Economic Minerals of Canada"

408. Economic Geology.

Fourth Year, Second Semester. Fifteen Weeks, Two Hours, per Week,

Discussion of general features and formation of ore deposits; the cause of formation of cavities in rocks; their relation to ore bodies; discussion of the theories of ore deposition; description of deposits of ores of iron, copper, lead, zinc, silver, gold, and lesser metals, with their occurrence, structure and geographic distribution.

References:

Kemp:—"Ore Deposits of the United States and Canada."

Ries:—"Economic Geology of the United States."

Beck:—"Nature of Ore Deposits."

Merrill:—"Rock Weathering and Soils."

Reports of the Geological Surveys of the United States and Canada.

415. Mine Surveying.

Third Year, First Semester, Fifteen Weeks, Two Hours per Week.

This course aims to acquaint the student with the special adaptations of surveying instruments and practices that are common in mine surveying.

Mine surveying instruments and accessories, underground stations, carrying a meridian underground, survey of secondary opening, survey record, use of mine maps, plotting mine maps, map filing, bore hole surveys.

Text:

Trumbull:—"Underground Surveying."

References:

Brough:—"Mine Surveying."
Lupton:—"Mine Surveying."

420. Assaying.

Third Year, Second Semester, Fifteen Weeks, Six Hours per Week.

The purpose of this course is to acquaint the student with the theory and practice of modern fire assaying. The training also prepares the student for the course in metallurgical laboratory, where he is required to trace the ore values through the mill runs and metallurgical tests that make up the latter. It also prepares him to quickly become an expert assayer after he leaves college, if he starts his engineering practice in such a position.

Lectures are given from time to time covering the following points: assay furnaces, tools, reagants, sampling, weighing, reduction and oxidation reactions, slag formation; the various methods of crucible fusion, scorification, cupellation, parting, and special methods for special ores and metallurgical products.

Reports will be required weekly, and must be kept up to date, otherwise full value for the work cannot be obtained.

The following assays are required:—Reducing power, silver ores by scorification and crucible assay, gold ores by pot and muffle furnace fusion, lead ores by crucible fusion, ores with metallics, base and dore bullion, cyanide solutions, pig or blister copper, special ores and metallurgical products

Text.

Fulton:—"Fire Assaying."

References:

Lodge:—"Notes on Assaying."

Austin:—"Fire Assay."

Bugbee:—"Notes on Fire Assaying."

425. Principles of Metallurgy.

Third Year, First Semester, Fifteen Weeks, Three Hours a Week.

This course deals with metals, furnaces, fuels, and typical metallurgical processes, agents and products. It serves as an introduction to the course in the second semester of the junior year on metallurgy of non-ferrous metals and also to the course on the metallurgy of iron and steel.

The general subjects treated in detail are as follows:—

Fundamental principles of modern metallurgy; physical properties of the metals; alloys; combustion and fuels; heat utilization; measurement of high temperatures and refractories.

Especial emphasis is placed on the study of the heating values of different coals.

Text:

Fulton:—"Principles of Metallurgy."

References:

Roberts-Austen:—"Introduction to the Study of Metallurgy."

Sexton:—"Fuel."

Sexton:—"Alloys."

Damour-Queneau:—"Industrial Furnaces."

Goerens:—"Introduction to Metallography."

Juptner:—"Heat, Energy, and Fuels."

426. Non-Ferrous Metallurgy.

Third Year, Second Semester, Fifteen Weeks, Three Hours a Week.

The main principles and modern practices of the metallurgy of the five principal metals are taken up in this course. The metals considered are copper, gold, lead, silver and zinc. The main stress is laid upon copper and gold.

METALLURGY OF COPPER.

The subjects of roasting of copper ores, blast furnace, pyrite and reverberatory furnace smelting, and slags. The production of metallic copper from matte, and the refining of copper are taken up in detail.

GOLD.

This subject includes lectures and study on stamp milling; chlorination; cyanide process, and the production of gold bullion.

SILVER.

The roasting of silver ores; pan amalgamation; hyposulphite leaching and cyanide processes are taken up in detail.

LEAD.

Reverberatory smelting; roast smelting; open hearth and blast furnace smelting are discussed and several lectures given on the desilverization of base bullion and cupellation.

ZINC.

The metallurgy of zinc is treated briefly.

Texts and References:

Schnabel-Louis:—"Handbook of Metallurgy."

Peters:—"Principles of Copper Smelting."

Peters:—"Modern Copper Smelting."

Rose:—"Metallurgy of Gold."

Julian and Smart:—"Cyaniding of Gold and Silver Ores."

Hofman:—"Metallurgy of Lead."

Collins:—"Metallurgy of Silver."

Ingalls:—"Metallurgy and Properties of Zinc."

Austin:—"Metallurgy of Common Metals."

427. Metallurgy of Iron and Steel.

Fourth Year, First Semester, Fifteen Weeks, Three Hours per Week.

In this course the metallurgy of iron and steel as carried out today is dealt with thoroughly. No obsolete practice is taken up unless deemed necessary for showing the devel-

opment of a process. Much stress is laid upon metallurgical and thermal chemistry as applied to the iron and steel industry.

Pig Iron:—Ores, fuels, and fluxes, iron blast furnace and accessories, smelting practice, chemistry of process, calculating blast furnace charge, comparison of processes of purification of pig iron.

Wrought Iron and Crucible Steel:—Different processes of making wrought iron, elimination of impurities. Process and plant for making crucible steel, chemistry of processes.

Acid and Basic Bessemer Steel:—Plant and modern practice of acid and basic processes, chemistry and thermal efficiency of converters, comparison of two processes.

Acid and Basic Open-Hearth Steel:—Open-hearth furnaces and accessories ,acid and basic open-hearth practice. Special open-hearth processes, duplex process, chemistry and thermal efficiency of processes.

Mechanical Treatment of Steel:—Forging, rolling, stamping, drawing, etc. Rolling mill practice, heating furnaces.

Iron and Steel Foundry:—Making of molds, design of patterns, cupola furnaces, steel casting practice, malleable castings.

Constitution of Iron and Steel:—Solution theory as applied to metals and their alloys, freezing curves, Roozeboom diagram, micro-constituents of iron and steel, metallography of iron and steel, physical properties, effect of impurities on cast iron and steel.

Heat Treatment of Steel:—Annealing, hardening and tempering of steel, improper heat treatment, constituents of hardened and tempered steel.

Special Steels.
Corrosion of Iron and Steel.
Electro-metallurgy of Iron and Steel.

Text.

Stoughton:—"Metallurgy of Iron and Steel."

References:

Campbell:—"Manufacture and Properties of Iron and Steel."

Forsythe:—"The Blast Furnace."

Harbord:—"Metallurgy of Steel."

Osmond and Stead:—"Microscopic Analysis of Metals."

Howe:—"Iron, Steel and Other Alloys."

428. Metallurgy of Iron and Steel.

Fourth Year, First Semester, Lectures Two Hours a Week. Short Course for Civil, Electrical and Mechancial Engineers.

This course covers the same subjects as are taken in course 427 but in an abridged form, with the exception of the following divisions, which are taken up in detail:—

Mechanical Treatment of Steel; *Iron and Steel Foundry*; *Constitution of Iron and Steel*; *Corrosion of Iron and Steel.*

The idea is to deal principally with the physical and chemical properties of iron and steel, rather than with the metallurgical processes of manfacture.

Text.

Stoughton:—"Metallurgy of Iron and Steel."

450. Exploration and Shaft Sinking.

Third Year, First Semester, Fifteen Weeks, Three Hours per Week.

This course serves as an introduction to engineering as applied to mining. A syllabus of the material treated is practically as follows:

Prospecting:—Value of geology in prospecting, surface indications, trenching, trial pits, special indications of copper, iron, gold, zinc, coal, etc., prospecting for gold by glacial indications in Nova Scotia.

Boring:—Hand augers, well-auger, American oil-well borer, Keystone driller, boring by percussion with rods, diamond drilling, shot drills. Surveying bore holes; costs.

Shaft and Slope Sinking:—Methods of drilling, firing and sinking, different methods of supporting circular and rectangular shafts, shaft timbering details, special methods of sinking in running ground, forepoling, sinking shoe with brick or concrete lining, tubbing, Poetsch freezing process, Kind-Chaudron process, caissons, cementation, cost of sinking shafts.

Supporting Excavations:—Timber preservation, various methods of supporting levels with timber, special timbering for soft ground, Nevada square set methods, masonry and steel supports.

Hydraulic Mining and Dredging:—Prospecting placer ground, general consideration of dams, flumes, and ditches, special apparatus and practice in hydraulic mining, dredging machines, modern dredging practice, metallurgy and costs of dredging.

Texts.

Donaldson:—"Practical Shaft Sinking."
Storms:—"Timbering and Mining."
Weatherbe:—"Dredging for Gold in California."

454. Excavation.

Third Year, Second Semester, Fifteen Weeks, Two Hours per Week.

Daily problems are introduced into this course wherever possible.

Explosives:—Gunpowder, composition of high explosives, such as gun cotton, nitroglycerin, dynamites, blasting gelatine, etc. Sprengel explosives, fulminates, "permitted" explosives, cartridges, detonators, fuses, care of explosives, theory of blasting, methods of drilling for excavations, electric machines for firing.

Compressed Air Machinery:—Wet and dry compressors, straight line and duplex, simple and compound (stage) compression, heat of compression, conveyance of compressed air, reheating, operating machinery using compressed air, valve details of various makes, indicator air-cards, duty and efficiency, receivers, various types of air drills, as Darlington, Ingersoll, Rand, Sullivan, Holman, Leyner, etc., electric drills, coal undercutting machines of puncher, disc, and chain types, tunneling machines, compressed air locomotives, compressed air auxiliary engines for hoisting, etc.

References.

Guttman:—"Blasting."
DeKalb:—"Manual of Explosives."
Peele:—"Compressed Air Plant for Mines."
Weston:—"Rock Drills."

451. Exploitation, Haulage, and Pumping.

Fourth Year, Second Semester, Fifteen Weeks, Three Hours a Week.

Exploitation:—Opening up of deposits, choice of plan of working, shaft versus slope, adits, overhand and underhand stoping. Methods of working ore bodies, working out beds with permanent and with temporary pillars, pillar robbing, caving system, slicing methods, milling method, systems of filling, special methods applied to masses and thick ore bodies.

Special Methods of Working Coal:—Bord and pillar systems and various modifications, long wall, working steep seams, working contiguous seams, shaft pillars, subsidence, submarine mining.

Mine Haulage:—Cars, tracks, animal haulage, steam, air, and electric locomotive haulage; comparative costs. Wire rope haulage systems; details, adaptability, comparative cost of endless rope and main and tail rope haulage, back balances, mine tubs and aerial tramways. Hoisting, winch, windlass, whim. Power machinery for hoisting; steam engines for hoisting, first, second and third motion geared engines, use of water wheels, gasolene engines and electric motors for hoisting. Cylindrical and conical drums, reels, various forms of hand, steam, and automatic brakes; methods and calculations for compensation, calculations for size of hoisting engine, Koepe and Whiting systems. Ropes, rope cappings, buckets, cages; pulleys, detaching hooks, safety clutches, keps, surface and underground arrangement of hoisting plant.

Head frame and accessories, hoisting engines, calculation for size of engines, counterbalancing. Special systems for winding from great depths. Special methods of winding in coal mines.

Pumping:—Origin of underground water; drainage through adits. Cornish pumping engine and compressed air pumps; piston and plunger, inside and outside packed, duplex pumps; differential plunger pumps, compound and triple expansion pumps, power driven pumps, centrifugal pumps. Frenier pumps, bucket lifts, pulsometers, air lift, rotary pumps. Different pump valve gears, as Cameron, Blake, Knowles, Worthington; costs of pumping. Dams, installation of pumping plants.

Texts and References:

Foster:—"Text-book of Ore and Stone Mining."
Richards:—"Mining Notes."
Ihlseng:—"Manual of Mining."
Hughes:—"Text-book on Coal Mining."
International Text-book Co.:—"Coal Mining."
Boulton:—"Practical Coal Mining."
Mayer:—"Mining Methods in Europe."
Hoover:—"Principles of Mining."

452. Ventilating, Lighting, Accounting and Valuation.

Fourth Year, Second Semester, Fifteen Weeks, Three Hours a Week.

Ventilation:—Gases met with in mines, coal-dust, laws of friction, theory of air currents, mechanical ventilators, details of different types, fan engines, motors and methods of connection, secondary ventilation, useful effect, efficiency. Stoppings, doors, brattice, regulators, air-crossings, losses in circulation, theory of splitting problems. Testing for various gases, explosive mixtures, natural ventilation by furnace, water blast and steam jets, fan ventilation;

various types of fans as Guibal, Schiele, Capell, Nasmyth, Murphy, Waddle and Sirocco. Manometric efficiency. Production of air currents, regulators, laws of friction, splitting of air currents, calculations relative to splitting, equivalent orifice of a passage, summation of orifice in series, graphic method of orifices, mine explosions, mode of procedure to recover miners and mines, rescue breathing apparatus, mine fires, cause and methods of suppression or exclusion.

Lighting:—Candles, torches, acetylene lamps. Naked lights, electric lighting. History of development of safety lamps. Modern lamps, such as Ashworth-Heppelwhite, Muesseler, Marsaut, Wolf, Morgan, etc. Underground lighting stations. Delicate indicators, as Pieler, Chesneau, Stokes, Ashworth, Shaw.

Accounting:—Cashbook, journal, and ledger, and how to keep them. Distribution of expense and segregation of costs. Prime cost, maintenance, mine development and depreciation, renewal fund, sinking fund.

Valuation:—Sampling a mine, contamination of samples, calculation of results, estimation of probable value; examples.

Texts and References:

Foster:—"Textbook of Ore and Stone Mining."

Richards:—"Mining Notes."

Ihlseng:—"Manual of Mining."

International Text-book Co.:—"Coal Mining."

Coal and Metal Miners' Pocket Book.

Boulton:—"Practical Coal Mining."

Wallace:—"Simple Mine Accounting."

Rickard:—"Sampling and Estimation of Ore in Mine."

Hoover:—"Principles of Mining."

453. Ore Dressing.

Fourth Year, First Semester, Fifteen Weeks, Three Hours per Week.

It is the purpose of this course to acquaint the student with the general theory and principles that underlie the modern practice of ore dressing. The theories and principles are illustrated by machines and mills that represent the most advanced methods of the preparation of ores and the extraction of their values. The different types of machines are criticized and also the combinations of machines that represent different milling practices.

Breaking:—Crushing, comminuting.

Preliminary:—Crushers, breakers, rolls, steam and gravity stamps, pulverizers, laws of crushing.

Separating:—Concentrating, washing.

Preliminary Washers:—Sizing screens and principles of screen-sizing, classifiers, laws of classifying by free and hindered settling in water, hand-picking, jigs, laws of jigging, fine sand and slime concentrators, amalgamation, magnetic concentration, pneumatic concentrators, miscellaneous processes of separation.

Accessory Apparatus:—Bins, receiving floors, samplers, feeders, distributors, conveyers, elevators and wheels, pumps, launders, unwaterers, miscellaneous apparatus.

Surface Plant:—Power house and distribution, plant arrangement, tipples, screens, conveyors, bins, chutes, coal washing plant and accessories, Robinson, Coppee, Luhrig, and Baum machines, coal washing jigs and tables.

Mill Processes and Management:—Summary of principles of sepsration, study of different classes of milling practice from typical mills.

General Ideas on Milling:—Mill location, construction of buildings, power, power transmission, ventilation, lighting, labor, water, disposal of products, percentage extraction, limit of concentration, accounts and reports, losses and costs, testing an ore for a process.

Text:

Richards:—"Ore Dressing."

460. Mill Construction.

Fourth Year, First Semester, Six Weeks, Five Hours per Week.

This course treats of the construction and equipment of mill and smelter buildings. It will include information on such structures as are required for sampling plants, ore concentration, steel mills, stamp mills, copper and lead smelters, etc. The course is designed to cover the great number of practical details which the mining engineer frequently needs in construction work, especially in isolated localities.

Attention will be given to such practical details as are outlined below:

Erecting building and machinery foundations, concrete construction, wooden and steel mill construction, saw-toothed roof construction, head frames, trusses and trestles, coal tipples, roof coverings, laying out shafting, pulleys, belts and belting, erection of machines, pipe-fitting, setting of boilers, setting of turbines, lighting of mill buildings, protection of iron and steel from corrosion, cost of foundations, retaining walls, erection of buildings, installation of machinery, maintenance, depreciation.

Mechanism, mechanical powers, shafts, couplings, bearings, clutches, transmission of power by belts, ropes, friction gears, chains and cams.

References:

Kidder:—"Architects' and Builders' Pocket-Book."

Hobart:—"Millwrighting."

Ingalls:—"Notes on Metallurgical Mill Construction."

Ketchum:—" Design of Mill Structures."

461. Mine Plant Design.

Fourth Year, First and Second Semesters, Six Hours per Week.

In this course the student is required to design some actual small plant, or some portion of a small plant, as would be necessary in the development of mining or metallurgical enterprise. Working drawings of some such plant as a stamp mill, steel or wooden head frame, concentration plant, smelter building, skip, cage, head frame, ore bin, bank head, etc., are prepared. The drawings must be supplemented also by bills of material, specifications and estimates.

465. Thesis.

Fourth Year, Second Semester, Fifteen Weeks, Eight Hours per Week.

This consists of an elementary, original investigation into some mining or metallurgical problem. This should acquaint the student with the methods of scientific investigation, so that he will know how to tackle problems that arise in engineering work. The student must choose his subject before the end of the first semester of the fourth year. He must prepare a card catalogue and abstracts of the literature bearing on his problem and prepare a thorough complete report on the work in acceptable form.

466. Summer Course in Mining.

Third and Fourth Year, Summer Vacation, Four to Six Weeks of Observation, Sketching, etc., at Typical Mines and Plants.

Held Every Second Summer.

This course, which lasts from four to six weeks in the summer between the third and fourth years, consists in visits to typical mining and metallurgical plants in operation in Nova Scotia. The first week is spent in geological surveying and mapping of some interesting quadrangle. The rest of the time is spent in practical mine surveying, observation, note taking, and sketching of various metal mining, ore concentration, coal mining, iron smelting or steel works, of which there are splendid examples in this province. Notes and sketches are written up in the evening. A full neat report with sketches is required to be handed in by the students at the beginning of the autumn semester. Nearly all the students work in the mines in some practical capacity, either in actual mining or surveying, and thus gain experience and aptitude that is invaluable in making their last year's course interesting and vital.

Coal Mining Engineering.

This Course will be called "*The Coal Mining Engineers' Option of the Regular Course in Mining Engineering.*" It is for the benefit of those students who wish to fit themselves as mining engineers, having coal mining as the ultimate end in view.

In the Third Year, First Semester, time is taken from the chemical end of the work and applied to the mechanical and electrical course.

In the Third Year, Second Semester ,time is taken from assaying and chemistry and given to work under steam machinery and electrical machinery.

In the Fourth Year, First Semester, time is taken from metallurgical laboratory, etc., and given over to work in electrical distribution, alternating currents, etc.

In the Fourth Year, Second Semester extra time is given to steam and gas power plants at the expense of metallurgical laboratory.

This course should enable a man to prepare himself to meet the problems arising in and around collieries in the mechanical, electrical or mining branches of engineering.

The course is based upon the experience of some of the oldest of the established Technical Colleges in this line, and we present it with a belief that it will prepare men to become efficient Colliery Superintendents and Managers.

The course leads to a degree of Bachelor of Science, as does the Regular Mining Engineering Course.

The course will be given in any year when two students apply for the privileges of the same. For a tabulated statement of the whole course, see p. 90 & 91.

Military Instruction.

500. Mapping, Organization, Tactics.

Third Year, First Semester, Four Weeks, One Hour per Week.

"A." Map Reading and Field Sketching.

The subject matter of Part I. of the "Manual of Map Reading and Field Sketching."

Text.

Manual of Map Reading and Field Sketching.

"B". Military Administration and Organization.

Third Year, First Semester, Three Weeks, One Hour per Week.

The administration, organization, equipment, establishment, terms of service and pay of the Canadian Militia for both peace and war.

Texts.

" King's Regulations and Orders for the Canadian Militia."
" Field Service Regulations, " Part II. (Organization and Administration.)"
" Field Service Pocket Book."

Tactics.

Third Year, First Semester, Eight Weeks, One Hour per Week.

Tactics as contained in " Field Service Regulations," Part I. (Operations).

The application of tactical principles to schemes worked out on a map.

Text Book.

" Field Service Regulations," Part I. (Operations).

510. Physical Training.

Third Year, First Semester, Two Half-hours per Week.

Text Book.

"Syllabus of Physical Exercises for Schools (Canada).

501. History aud Field Engineering.

"A". Military History.

Third Year, Second Semester, Four Weeks, One Hour per Week.

The strategy and general conduct of a selected campaign.

The study of this campaign with reference to the principles laid down in Field Service Regulations.

Text.

Official History of the selected campaign.

"B". Coast Defence Electric Lighting.

Third Year, Second Semester, Four Weeks, Two Half-hours per Week.

Principles of coast defence, with special reference to electric lighting apparatus in the service used in connection with defence electric lights.

Text Book.

" Military Electric Lighting "; Vol. II.

"C". Field Engineering.

Third Year, Second Semester, Ten Weeks, One Hour and Two Half-hours per Week.

The role of engineers on Active Service.

The subject matter of the Manual of Field Engineering and the application of its principles to schemes worked out on the map.

Texts.

" Manual of Field Engineering."
" Field Service Pocket Book."

Land Surveying.

Short Course, Two Months, January and February.

This course in land surveying is intended for beginners who wish to qualify themselves for Provincial Land Surveying. It will cover the following range of subjects:

1. Study of common surveying instruments, such as compass, level and transit.

2. Adjustment of these instruments.
3. Use of these instruments in making land surveys.
4. Approved fmethods of keeping field notes.
5. Office calculations based on field notes.
6. Methods of mapping surveys of land.
7. Determination of true north.
8. Topographic surveying and plotting.

It is expected that the student will acquire the ability to survey quickly and independently any ordinary piece of farm or timber land, or mining area. It is also expected that he will learn how to do the ordinary office calculations quickly and accurately, make neat accurate plans of surveys and be able to describe and mark the boundaries of any certain area surveyed by him, so that there is no possibility of a misunderstanding arising afterward in this connection. It is only necessary for the applicant to have a fair working knowledge of English composition and plane trigometry.

A detailed outline of the different subjects as taught in the lectures, recitations, problems, and field work is as follows:—

Measurement of lines by pacing, chaining, or taping; angular measurements with hand compass; verniers and their uses in linear and circular measurements; the compass and its use in surveying; bearing and azimuths; declination of the magnetic needle and its variations; dip of needle; the

transit, its adjustments and its uses; errors, their source and prevention, field notes and office calculations; traverses, latitude and departure, checks; methods of plotting, parting of land; re-running of old lines; methods of locating a point; passing obstacles; other difficulties met in surveying practice; highway surveys; leveling; datum; form of notes; check hand level and its uses; wye and Dumpy levels, care and adjustment; leveling-rod, target and vernier; difficult leveling, profile leveling; leveling for drainage and highways; computation of earthwork; determination of true north—determination by observation on polaris, solar attachment, use of nautical almanac, determination by observation on sun.

Topographic maps and their value; methods of topographic surveying; contours; contour intervals. Triangulation; base-line, etc. Stadia surveying; stadia wires; stadia rods; value of stadia in topographic work; reduction of readings.

Mapping,—modern office methods, use and care of drawing instruments, lettering, plotting, plotting of lands by both length and bearings, plain and topographic mapping, contouring, conventional signs, tracing, blue printing, uses of planimeter and pantograph.

Organization and equipment of field parties and duties of members.

The fee for this course will be fifteen dollars ($15.00), payable in davance. The entire equipment of the department of Civil Engineering will be available for this course.

Highway Construction.

Short Course, Two Weeks in February.

This course is free. It is designed especially for road inspectors and road superintendents, and all others who are vitally concerned in the construction and mainteneance of

rural highways. The public is demanding good roads in Nova Scotia. The government is getting ready to spend large sums of money in rural highway construction. Every one who is to be or wants to be connected with this great piece of work, should take advantage of this course in the Technical College in Halifax this winter.

The course will be as practical as possible, and will not be too technical for any one to follow and profit by. Theory will be left in the back ground as much as possible, and the course will deal with actual construction and results. Special attention will be laid on the costs of various operations, and various kinds of construction. Some practical outside work will be done in learning the use of the hand level in laying out grades and in testing different road materials.

An outline of the course follows:—

Value of Good Roads:—Why a large expenditure on rural highways is justified, advantages of good roads to farmer, merchant and province, comparison of wagon haul and railroad haul.

Location of Highways:—The firxt important thing in highway construction is to get the proper location. The different factors such as cost, grades, amount of traffic, etc., will be carefully considered in regard to the profitableness of locating a new road or re-locating an old road. The effects of steep grades on the limits of hauling loads, as well as the cost of maintenance will be studied.

Road Building:—The three main points are foundation drainage, and surface.

1. *Foundation*:—Materials, such as sand, clay and loam; treatment of different foundation materials; shaping.

2. *Drainage*:—Surface drainage, ditching and crown; underground drainage.

3. *Surface*:—Materials, sand, clay, gravel and stone; sand clay roads; clay sand roads; gravel and stone roads, width and thickness of surfacing material, preparation of earth foundation, laying surfacing material, rolling and sprinkling, oiling.

Macadam roads:—Materials, test on available materials, different methods of construction, width, grades, cross esctions, destructive agents, patching, sprinkling, oiling, effects of automobiles, costs of construction and maintenance.

In all of the above operations, the costs are carefully considered.

Road Maintenance:—Effect of wide tires, earth road drag in its various forms, section system of maintenance.

Road Machinery:—The different kinds of road machinery are carefully studied from the catalogues of the manufacturers. The kinds of work for which each is suited is gone into with great care.

Culverts:—Wooden poles, timber, iron, tile, concrete, comparative costs of construction and upkeep: advantages and comparative life of different materials, and how different kinds of materials may be used to obtain the best results.

Small Bridges:—What small bridges may be constructed by road superintendents, and what ones should be designed by experts. The various points considered are:—(1) Location, (2) Size of opening, (3) Materials, (4) Abutments, (5) Costs.

Road Administration. Practice in using hand level, engineers' level, compass, and in drawing.

Fees.—This class is free to everybody.

CIVIL ENGINEERING.

Engineering Camp.
Three weeks field practice.

THIRD YEAR. FIRST SEMESTER.

	SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See.		Pre-Requisites, etc.
				Lecture and Class Room	Field Lab. or Drafting.	Page	Course	
1	Mechanics of Engineering I	Mechanics 1	15	5	.....	47	101	Third year Entrance.
2	Advanced Surveying	Civil Eng. 1	15	1	3	49	119	Third Year Entrance.
3	Railroad Engineering I	Civil Eng. 2	15	4	.....	50	121	Third Year Entrance.
4	Thermodynamics I	Thermo. 1	15	3	.....	38	301–A	Third Year Entrance.
5	Mechanical Eng. Laboratory	Mech. Eng. 3	15	1	3	42	350	Concurrent with 301–A.
6	Electrical Machinery	Elec. Eng. 1. A	15	3	.....	27	201–A	Third Year Entrance.
7	Electrical Laboratory	Elec. Eng. 2	15	.....	3	32	250–A	Concurrent with 201–A.
8	Military Science	Mil. Science 1	15	1	.....	76	500	Third Year Entrance.

THIRD YEAR. SECOND SEMESTER.

	SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
				Lectures. and Class Room	Field Lab. or Drafting.	Page	Course	
1	Mechanics of Engineering II	Mechanics 2	1st. 9	5	.....	48	102	101
2	Materials Testing	Mechanics 3	15	.....	3	48	103	Concurrent with 102.
3	Structures I	Civil Eng. 3	Last 6	5	.....	48	105	102
4	Advanced Surveying	Civil Eng. 4	15	2	3	50	120	119
5	Railroad Engineering II	Civil Eng. 5	15	3	.....	50	122	121
6	Highway Engineering	Civil Eng. 6	10	2	.....	51	131	Third Year Entrance.
7	Electrical Mach	Elec. Eng. 4	15	2	.....	27	202–A	201–A
8	Military Science	Mil. Science 2	15	1	.....	78	501	500
9	Steam Machinery	Thermo. 2	Last 6	5	.....	39	302–A	301–A

FOURTH YEAR. **CIVIL ENGINEERING.** FIRST SEMESTER.

Engineering Camp
Three weeks field practice.

	SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
				Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
1	Theoretical Hydraulics	Hydraulics. 1	15	3	.....	49	111	101–102
2	Hydraulic Laboratory	Hydraulics. 2	15	.....	3	49	112	Concurrent with 111.
3	Railroad Design	Civil Eng. 7	15	.....	3	51	124	121
4	Masonry Construction	Civil Eng. 8	15	2	.....	52	141	102
5	Materials Testing	Mechanics 4	15	.....	3	52	142	Concurrent with 141.
6	Structures II	Civil Eng. 9	15	3	.....	54	174	105 .
7	Structural Design I	Civil Eng 10	15	.....	9	54	176	Concurrent with 174.
8	Economic Geology	Geology 3	15	2	.....	59	407	Third Year Entrance.
9	Metallurgy of Iron and Steel	Metallurgy 3	15	2	.....	....	428	Third Year Entrance.

FOURTH YEAR. SECOND SEMESTER.

	SUBJECTS.	Reference No	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
				Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
1	Water Supply	Civil Eng 11	15	3	.....	52	151	111–112
2	Hydraulic Design	Civil Eng 12	15	.....	2	53	152	Concurrent with 151.
3	Hydraulic Engineering	Hydraulics 3	15	3	.....	53	153	111–112
4	Sewerage and Sewerage Disposal	Civil Eng 13	15	3	.....	53	162	111–112
5	Sewer Design	Civil Eng. 14	15	.....	3	54	163	Concurrent with 162.
3	Structures III	Civil Eng. 15	15	3	.....	54	175	174
7	Structural Design II	Civil Eng. 16	15	.....	9	55	177	Concurrent with 175.
8	Contracts and Specifications	Contracts	15	1	.....	55	191	Third Year Entrance.

THIRD YEAR. **MECHANICAL AND ELECTRICAL ENGINEERING.** FIRST SEMESTER.

	SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisities etc.
				Lecture and Class Room	Field Lab. or Drafting.	Page	Course	
1	Electrical Machinery	Elect. Eng. 1	15	3	.....	27	201	Third Year Entrance.
2	Electrical Laboratory	Elect. Eng. 2	15	1	3	32	250	Concurrent with 201
3	Thermodynamics	Thermo. 1	15	5	.....	38	301	Third Year Entrance.
4	Electrical Engineering Abstracts	Elect. Eng. 3	15	1	.....	28	205	Third Year Entrance.
5	Mechanical Eng. Laboratory	Mech. Eng. 3	15	1	3	42	350	Concurrent with 301.
6	Mechs. of Engineering I	Mechanics 1	15	5	.....	47	101	Third Year Entrance.
7	Military Science	Mil. Science 1	15	1	.....	76	500	Third Year Entrance.
8	Machine Drawing and Design	Mech. Eng. 2	15	.....	6	44	331	Third Year Entrance.
9	Machine Design Theory	Mech. Eng. 1	15	3	.....	43	329	Third Year Entrance.

THIRD YEAR. SECOND SEMESTER.

	SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisities etc.
				Lecture and Class Room	Field Lab. or Drafting.	Page	Course	
1	Electrical Machinery	Electrical Eng 4	15	2	.....	27	202	201
2	Electrical Laboratory	Electrical Eng. 5	15	1	3	32	251	201
3	Steam Machinery	Thermo. 2	1st. 6	5	.....	39	302	301
4	Electrical Eng. Abstracts	Electrical Eng. 6	15	1	.....	28	206	205
5	Mechanical Eng. Laboratory	Mech. Eng. 4	15	1	3	42	351	350
6	Mechs. of Engineering II	Mechanics 2	1st. 9	5	.....	48	102	101
7	Testing Materials	Mechanics 3	15	.....	3	48	103	Concurrent with 102
8	Structures I	Civil Eng. 3	Last 6	5	.....	48	105	101
9	Military Science	Mil.Science 2	15	1	.....	78	501	500
10	Machine Drawing and Design	Mech. Eng. 5	15	.....	6	44	332	331
11	Machine Design Theory	Mech. Eng. 2 A	15	2	.....	43	330	329

FOURTH YEAR. MECHANICAL AND ELECTRICAL ENGINEERING. FIRST SEMESTER.

	SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
				Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
1	Machine Design Theory.....	Mech. Eng. 7.....	15	2	.....	44	330	330
2	Steam Power Plants.....	Mech. Eng. 8.....	15	3	.....	39	303	302
3	Theoretical Hydraulics.....	Hydraulics 1.....	1st 9	5	.....	49	111	101
4	Hydraulic Testing.....	Hydraulics 2.....	15	.....	3	49	112	Concurrent with 111.
5	Met. of Iron and Steel.....	Metallurgy 7.....	15	3	.....	65	428	Third Year Entrance.
	Electrical Engineering Option							
6	Machine Design Practicum.....	Mech. Eng. 9 A....	15	.....	3	44	333A	351
7	Alt. Currents and Machinery....	Elec. Eng. 7.....	15	3	.....	28	203	202
8	Electrical Eng. Laboratory.....	Elec. Eng. 8.....	15	1	3	32	252	251
9	Electrical Engineering Abstracts .	Elec. Eng. 9.....	15	1	.....	28	207	206
10	Storage Battery Engineering.....	Elec. Eng. 10.....	15	2	.....	33	215	202–253
	Mechanical Engineering Option.							
6	Mechanical Engineering Lab....	Mech. Eng. 6.....	15	.....	3	42	352	351
7	Mechanical Engineering Abstracts	Mech. Eng. 13....	15	1	.....	41	307	206
8	Heating and Ventilating.....	Mech. Eng. 12....	15	3	.....	42	322	302
9	Machine Design Practicum.....	Mech. Eng. 9.....	15	.....	6	44	333	332

FOURTH YEAR. MECHANICAL AND ELECTRICAL ENGINEERING. SECOND SEMESTER.

	SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
				Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
1	Contracts and Specifications.....	Contracts 1.....	15	1	.....	46	220	.....
2	Hydraulic Engineering.....	Hydraulics 3.....	1st. 9	5	.....	53	153	111–112
3	Electrical Distribution.....	Elec. Eng. 15.....	15	3	.....	29	210	202
4	Machine Design and Drawing....	Mech. Eng. 16....	15	.....	6	36	334	333–333A
	Electrical Engineering Option							
5	Electric Railways.....	Elec. Eng. 16.....	15	2	.....	29	211	202–203
6	Electric Laboratory.....	Elec. Eng. 12.....	15	1	3	32	253	252
7	Alternating Currents.....	Elec. Eng. 11.....	15	3	.....	28	204	203
8	Design Problems.....	Elec. Eng. 17.....	15	1	6	30	212	203
9	Electrical Abstracts.....	Elec. Eng. 13.....	15	1	.....	28	208	207
	Mechanical Engineering Option							
5	Steam Turbines.....	Mech. Eng. 10....	15	2	.....	40	305	302
6	Gas Engines.....	Mech. Eng. 11....	15	3	.....	40	306	301
7	Mech. Eng. Laboratory.....	Mech. Eng. 17....	15	1	3	42	353	352
8	Mech. Eng. Abstracts.....	Mech. Eng. 18....	15	1	.....	41	308	307
9	Design Problems.....	Mech. Eng. 19....	15	1	6	45	336	333

THIRD YEAR. **MINING ENGINEERING.** FIRST SEMESTER.

Engineering Camp.
Three weeks field practice.

SUBJECTS	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
			Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
Mechanics of Engineering I	Mechanics 1	15	5	.....	36	101	Entrance Requirements
Thermodynamics	Thermo 1	1st 9	5	.....	34	301A	Entrance Requirements
Applied Geology	Geology 1	5	2	.....	57	405	Entrance Requirements
Exploration and Shaft Sinking	Mining 1	Last 6	5	.....	67	450	Entrance Requirements
Quantitative Analysis	Chemistry 1	15	2	10	55	400	Entrance Requirements
Principles of Metallurgy	Metallurgy 1	15	3	.....	62	425	Entrance Requirements
Mechanical Laboratory	Mech. Eng 3	15	.....	3	42	350	Entrance Requirements
Military Science	Mil. Science 1	15	1	.....	76	500	Entrance Requirements

THIRD YEAR. SECOND SEMESTER.

SUBJECTS	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
			Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
Mechanics of Engineering II	Mechanics 2	9	5	.....	36	102	101
Structures I	Civil Eng. 3	6		.....	36	105	101
Steam Machinery	Thermo 2	1st. 9	3	.....	39	302A	301A
Mechanical Laboratory	Mech. Eng. 4	1st. 9	.....	3	42	351	350
Excavation	Mining 2	Last 9	5	.....	68	454	450
Quantitative Analysis	Chem. 2	15	1	6	55	401	400
Non-Ferrous Metallurgy	Metallurgy 2	15	3	.....	63	426	425
Mineralogy	Geology 2	15	2	3	58	406	405
Assaying	Chemistry 3	15	.....	6	61	420	400
Military Science	Mil. Science 2	15	1	.....	78	501	500

FOURTH YEAR. MINING ENGINEERING. FIRST SEMESTER.

Summer School of Mining.
Four to Six weeks.

SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
			Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
Summer School in Mining	.....	4-6	.....	.....	75	466	Third Year Work.
Mill Construction	Mining 3	1st. 6	5	.....	73	460	101, 102, 105
Mine Plant Design	Mining 4	15	.....	6	74	461	With 460
Metallurgy of Iron and Steel	Metallurgy 3	15	3	.....	64	427	400, 401
Metallurgical Laboratory	Metallurgy 4	15	.....	8	57	403	420
Electrical Machinery	Elec. Eng. 18	Last 9	5	.....	27	201A	Entrance
Testing Materials	Mech 3	15	.....	3	36	103	101, 102, 105
Ore Dressing	Metallurgy 5	15	3	.....	72	453	Entrance
Economic Geology	Geology 3	15	2	.....	59	407	405, 406
Hydraulics	Hydraulics 1	1st. 9	3	.....	49	111	101
Hydraulic Laboratory	Hydraulics 2	1st. 9	.....	3	49	112	101

FOURTH YEAR. SECOND SEMESTER.

SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
			Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
Exploitation, Haulage, Pumping	Mining g 5	15	3	.....	69	451	.....
Metallurgical Laboratory	Metallurgy 6	15	.....	8	57	404	403
Ventilation, Val. & Acct.	Mining 6	15	3	.....	70	452	.....
Mine Plant Design	Mining 4	15	.....	6	74	461	460
Economic Geology	Geology 4	15	2	.....	60	408	107
Contracts and Specifications	Contracts 1	15	1	.....	46	220	.....
Mine Surveying	Mining 7	15	3	.....	60	415	Engineering Camp
Thesis	Mining 8	15	.....	8	74	465	All preceding work

THIRD YEAR. **MINING ENGINEERING.** FIRST SEMESTER.

Engineering Camp.
Three weeks field practice.

(Coal Mining Option.)

SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
			Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
Mechanics of Engineering I	Mechanics. 1	15	5	.....	25	101	Entrance Requirements
~~Thermodynamics~~	Thermo. 1	1st 9	3	.....	47	301A	Entrance Requirements
Applied Geology	Geology 1	15	2	.....	63	405	Entrance Requirements
Principles of Metallurgy	Metallurgy 1	15	3	.....	70	425	Entrance Requirements
Mechanical Eng. Laboratory	Mech. Eng. 3	15	.....	3	49	350	Entrance Requirements
Electrical Machinery	Elec. Eng. 1	15	3	.....	27	201	Entrance Requirements
Electrical Laboratory	Elec. Eng. 2	15	.....	3	32	250	Entrance Requirements
Exploration & Shaft Sinking	Mining 1	Last 6	5	.....	67	450	Entrance Requirements
Advanced Surveying	Civil Eng[illegible]. 1	15	.....	9	29	120	Entrance Requirements
Military Science	Mil. Science 1	15	1	.....	87	500	Entrance Requirements

THIRD YEAR. SECOND SEMESTER.

SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
			Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
Mechanics of Engineering II	Mechanics 2	15	5	.....	26	102	101
Structures I	Civil Eng. 3	Last 6	5	.....	48	105	102
Steam Machinery	Thermo. 2	15	3	.....	39	302	301
Mech. Eng. Laboratory	Mech. Eng. 4	15	.....	3	42	351	302
Excavation	Mining 2	Last 9	5	.....	68	454	450
Non-Ferrous Metallurgy	Metallurgy 2	15	3	.....	63	426	425
Quantitative Analysis	Chemistry 2A	15	1	3	55	402	Special Short Course.
Electrical Machinery	Elec. Eng. 4	15	2	.....	27	202	201
Electrical Eng. Laboratory	Elec. Eng. 5	15	.....	3	32	251	201
Mineralogy	Geology 2A	15	.....	3	58	406	405
Mine Surveying	Mining 7	15	3	.....	60	415	Engineering Camp.
Military Science	Mil. Science 2	15	1	.....	78	501	500

FOURTH YEAR. **MINING ENGINEERING.** FIRST SEMESTER.

Summer Mining School. Four to Six weeks.

(Coal Mining Option.)

SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
			Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
Mill Construction	Min. Eng. 3	6–0	5	.....	73	466	101, 102, 105
Mine Plant Design	Min. Eng. 4	15	.....	6	74	461	With 460
Metallurgy of Iron and Steel	Metallurgy 3	15	3	.....	64	427	402
Metallurgical Laboratory	Metallurgy 4A	15	.....	3	57	403A	Short Crs. on Coals.
Steam Power Plants	Mech. Eng. 8	15	3	.....	34	303	301, 302
Testing Materials	Mechanics 3	15	.....	3	36	103	101. 102, 105
Ore Dressing	Metallurgy 5	15	3	.....	72	453	Entrance Requirements
Economic Geology	Geology. 3	15	2	.....	59	407	405, 406
Theoretical Hydraulics	Hydraulics 1	9–0	3	.....	49	111	101
Hydraulic Laboratory	Hydraulics 2	9–0	.....	2	49	112	101

FOURTH YEAR. SECOND SEMESTER.

SUBJECTS.	Reference No.	Weeks.	Hours Per Week.		For Details See		Pre-Requisites, etc.
			Lecture and Class Room.	Field Lab. or Drafting	Page	Course	
Ventilation, Valuation, Account'g	Min. Eng. 6	15	3	.....	70	452	.....
Mine Plant Design	Min. Eng. 4	15	.....	6	74	461	460
Exploration, Haulage, Pumping	Min. Eng. 5	15	3	.....	69	451	.....
Metallurgical Laboratory	Metallurgy 6A	15	.....	6	57	404	403A, short course on Coals.
Steam Turbines	Mech. Eng.	15	2	.....	40	305	301, 302
Gas Engines	Mech. Eng.	15	3	.....	40	306	301, 302
Electrical Distribution	Elec. Eng.	15	3	.....	29	210	201, 202
Thesis	Min. Eng. 8	15	.....	6	74	465	All preceding work.
Contracts and Specifications	Contracts	15	1	.....	46	220	.....

GRADUATES OF THE NOVA SCOTIA TECHNICAL COLLEGE.

1910.

Name.	Home Address.	Where Previously Educated.
F. R. Archibald	Halifax, N. S.	Dalhousie University.
F. M. Dawson	Truro, N. S.	Dalhousie University.
C. L. Dimock	Upper Newport, N. S.	Dalhousie University.
T. W. Hardy, Jr	Halifax, N. S.	Dalhousie University.
E. S. Kent	Truro, N. S.	Dalhousie University.
A. G. McAulay	Glace Bay, N. S.	Dalhousie University.
*N. W. McKay	Balmoral Mills	Dalhousie University.
Walter Putman	Maitland, N. S.	Dalhousie University.
E. L. Thorne, Jr	Dartmouth, N. S.	Dalhousie University.

1911.

Name.	Home Address.	Where Previously Educated.
H. F. Bober	Windsor, N. S.	King's College.
*J. L. Cavanagh	New Glasgow, N. S.	Dalhousie University.
K. G. Chisholm	Halifax, N. S.	Dalhousie University.
D. M. Collingwood	Upper Parkstone, Eng.	Dalhousie University.
T. M. DeBlois	Halifax, N. S.	Dalhousie University.
C. K. Hood	Yarmouth, N. S.	Mt. Allison University.
J. F. Lumsden	Gabarus, C. B.	Mt. Allison University.
R. W. McColough	Waverley, N. S.	Dalhousie University.
C. H. MacDonald	Sydney, C. B.	Dalhousie University.
J. A. MacKay	Balmoral Mills, N. S.	Dalhousie University.
L. A. Mylius	Halifax, N. S.	Dalhousie University.
Gordon S. Stairs	Halifax, N. S.	Dalhousie University.

1912.

Name.	Home Address.	Where Previously Educated.
G. V. Boone	St. Johns, Nfld.	Mt. Allison University.
D. R. McKean	West La Have, N. S.	Dalhousie University.
C. E. McKenzie	Springhill, N. S.	Dalhousie University.
Ranold McKinnon	New Aberdeen, N. S.	Dalhousie University.
J. W. Morrison	Oldham, N. S.	Dalhousie University.
C. B. North	Hantsport, N. S.	Mt. Allison University.
G. F. Simson	Halifax, N. S.	Dalhousie University.

*Not granted full Diploma.

SHORT COURSE IN LAND SURVEYING.

1911.

Name.	Home Address.
W. L. Brine	French Village, N. S.
C. F. Clark	Halifax, N. S.
H. J. Ewan	Yarmouth, N. S.
*W. H. Hooke	Halifax, N. S.
*R. A. Logan	Middle Musquodoboit, N. S.
*R. J. Macdonald	Halifax, N. S.
*R. J. Milgate	Middleton, N. S.
*P. G. Morrow	Halifax, N. S.

1912.

Name.	Home Address.
C. Avard White	Woodstock, N. B.
*Lindsay K. Patterson	Aylesford, N. S.
*Chas. F. Whitman	Halifax, N. S.
A. C. Webster	Canning, N. S.
*A. M. Foster	Bridgetwon, N. S.
C. Hagan	Church Street, N. S.
*Raymond Chisholm	Harbour Bouche, N. S.
V. N. Elderkin	Port Grevale, N. S.
*Daniel A. Gasper	Truro, N. S.
*J. O. Hunton	Sackville, N. B.

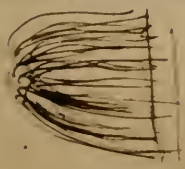
*Diplomas Awarded.

UNDERGRADUATES OF THE NOVA SCOTIA TECHNICAL COLLEGE 1912.

Name.	Home Address.	Where Previously Educated.
I. P. MacNab	Upper Malagash, N. S.	Mt. Allison University.
C. A. D. Fowler	Halifax, N. S.	Mt. Allison University.
R. B. Roach	Windsor, N. S.	King's College.
P. D. Mosher	Newport Station, N. S.	Mt. Allison University.
E. W. G. Chapman	Halifax, N. S.	Dalhousie College.
C. J. MacGillivray	Antigonish, N. S.	St. Francis Xavier Col.
R. R. Murray	Springhill, N. S.	Acadia College.
H. W. Mahon	Bedford N. S.	
R. B. Carson	Dartmouth. N. S.	Dalhousie College.
W. H. Noonan	Pictou, N. S.	Dalhousie College.
A. F. R. Kendall	Sydney, N. S.	
L. P. Norrie	Truro, N. S.	Mt. Allison University.
R. P. Freeman	Halifax, N. S.	Dalhousie College.
J. M. Poole	Halifax, N. S.	King's College.
H. S. McKean	North Sydney, N. S.	Mt. Allison University.
L. B. McCurdy	Truro, N. S.	Dalhousie College.
O. S. Cox	Upper Stewiacke, N. S.	Dalhousie College.
Angus MacLeod	Wreck Cove, N. S.	Dalhousie College.
L. D. Irving	New Glasgow, N. S.	Dalhousie College.
C. H. P. Williston	Halifax, N. S.	Dalhousie College.
R. A. Major	Halifax, N. S.	Dalhousie College.
H. W. L. Doane	Halifax, N. S.	Dalhousie College.
F. E. Hiseler	Halifax, N. S.	Dalhousie College.
N. T. Ashkins	Weymouth, N. S.	Dalhousie College.
H. M. Reynolds	Halifax, N. S.	Dalhousie College.
Jack P. C. Freeman	Liverpool, N. S.	Mt. Allison University.
John Messervey	Halifax, N. S.	Dalhousie College.
A. M. James	London, Ontario	Dalhousie College.
M. H. O'Brien	Springhill, N. S.	Acadia College.
C. S. Creighton	Dartmouth, N. S.	Dalhousie College.
A. A. Chapman	Dorchester, N. B.	King's College.
T. J. MacKavanagh	Halifax, N. S.	Glasgow & West of Scotland Technical Col.

Office Copy

LET US HELP YOU GET AHEAD



TAKE A CLASS

IN THE

EVENING TECHNICAL SCHOOL

THIS WINTER

Only two nights a week. Costs you practically nothing.

You can start anywhere from the most elementary to the most advanced.

There are young, middle-aged and old men in the classes.

These classes are better than correspondence instruction for the following reasons:—

1. There is a thoroughly trained practical man right on the spot as teacher who answers all questions.

2. You are working with other men and don't have to study alone.

3. We use the same texts as the correspondence schools to study from and you don't have to buy a reference library with the course unless you want it.

4. The cost of our classes is practically nothing. We furnish you drawing instruments and supplies at cost.

We have large, well equipped electrical laboratories in six localities where you can work with regular commercial machines.

Our teachers in your locality have been selected for their practical and theoretical knowledge. It is the combination that counts.

You can get an education while you are earning your living.

It takes only two nights a week.

If the class that you want isn't here—ask for it.

Remember that men today are being measured from the collar up.

To get ahead—get a head. This is a great chance. Take a class this winter.

Classes open about the middle of October.

Think it over.

For further information apply to

F. H. SEXTON.
197 *Hollis Street, Halifax.*

P. W. MACDONALD.
Rigby Road, Sydney.

JOHN T. MCLEOD.
High Street, New Glasgow

E. J. LAY.
Spring Street, Amherst.

CONTINUE
YOUR EDUCATION
WHILE YOU WORK

Evening Technical Schools

AMHERST
HALIFAX
NEW GLASGOW
SYDNEY
TRURO
YARMOUTH

TO GET AHEAD
GET A HEAD

2510

ARE YOU TIRED OF YOUR PRESENT WORK?

DO YOU WISH TO FIT YOURSELF FOR SOME SPECIAL JOB?

READ WHATEVER WE HAVE TO OFFER YOU.

When a machine wears out it goes to the scrap-heap.

An engine or locomotive that can't be made to go finally has to give place to a new one.

The good men get ahead; the no good get out. Often one man is promoted and his benchmate or friend is not.

Thousands of men are discharged every day—not wanted, incompetent.

You have noticed all this no doubt, but you may not have stopped to think WHY.

A good machine replaces a poor one, good land is cultivated instead of poor land, money is invested where it will pay back the most profit, one man gets ahead while his friend does not—all because a premium is placed on EFFICIENCY. A machine or a building or a field is used only so long as it can produce more than it costs to work it—so long as the product is greater than the outlay. Of two GOOD machines, the BEST one is always used. It is cheapest. This is as sure as two times one are two.

It is the same way with a man. It is the most productive man, the most efficient man, the best one, the man who can do most, who is wanted and always kept employed. If it is a case of promotion, the man who is ready goes ahead.

Each young man and each boy has his future and his chances of business success before him and these are determined by his trained ability, by what he can produce.

Real success today depends upon trained brains more than upon beef and muscle. Plenty of men are to be had for the hard manual work, but not enough men who can work their brains and their muscles together. Machines and mechanical contrivances do most of the hard work today. Men are needed to guide them with their brains.

Too few men are properly and practically educated or trained. Education and training are required for efficiency and the highest productive capacity where brain work is needed. A man need not suffer from a low productive capacity for lack of the right training. He need not stand the chance of being replaced by another or of never getting ahead. There is still a chance for him to know more and put himself in the way of promotion by taking up an evening class in the Technical School.

EDUCATION AND DOLLARS.

Twenty dollars a week is better than $10.; $50. is better than $25., especially if you are the man who gets it.

Do you know that a grammar school education increases a boy's or a man's earning capacity by 50 per cent.; that an Academy education adds 100 per cent. to his earning power, and a college education 200 per cent?

Each school day well put in is worth $122.22 to a boy in the course of his life. Government statistics prove it:—

The average working life is from 20 to 60, or about 40 years.

Average income of a man who went through the academy..$1000
In 40 years he earns..... $40,000

Average earnings of day laborer who just went through common schools is 300 days at $1.50 per day.....$450.
In 40 years he earns $18,000

Difference of earnings in lifetime, $40,000 less $18,000.....$22,000

This equals the value of the academy education.

The boy spends 3 years in the academy and attends school 180 days each year.

Total number of days in academy—
3 x 180 540

Then in his working lifetime the educated man's time in the academy is worth the extra amount he earns, which is $22,000.

Thus he really earned in the academy per day, the extra amount earned divided by the number of days in the Academy,

$$\text{or } \frac{\$22,000}{180} = \$122.22$$

Therefore the boy really earns $122.22 a day while he is in the academy.

ANY KIND OF EDUCATION REALLY PAYS IN THE LONG RUN.

THE SPECIAL EDUCATION OFFERED IN THE EVENING SCHOOLS IS BOUND TO PAY. READ ABOUT IT IN THE BACK PAGES OF THIS BOOK.

If most boys knew the money value of eduaction in time there would be fewer men who are struggling along, trying to get ahead but handicapped by lack of education. If fathers and mothers better understood how important it is for the boy to get all

the schooling possible before he starts in life, there would be fewer unsuccessful and discouraged men. Lack of schooling and education draws that "dead line" between failure and success.

Every young man, if he lacks the education he needs, discovers it sooner or later. He sees other fellows forge ahead of him. His friend gets a "raise" while he stays pegging away at the same old job. A man's future depends upon what he does. He may throw up his hands in discouragement, or what is better, he may grit his teeth, find out what he must do, and do it.

The first thing he needs is more education and better training. If he is in a machine shop, he must learn more about mathematics, drafting and mechanics; if he is in an office, he must write better, figure better, and get "a bull-dog grip on the business;" if he is a clerk it is the same way; if he is a carpenter or an electrician, there are many extra things he must know to get ahead in competition with other men who do know. To learn what he must know to get ahead today, a man has to spend extra hours so they will count, with books, at the bench, at the drafting table, with a teacher. He cannot afford to waste them as many young fellows do who are loafing about, "having fun" nights and spending all their spare time and money at billiards and bowling, at "movies" and loafing, giving no thought of what they will be ten years later. It is a question whether a man will be taking orders from somebody else, and doing poor work at poor pay, or giving orders and holding a position of responsibility.

EVENING TECHNICAL SCHOOLS.

CLASSES.

This winter the Evening Technical Schools in Amherst, Halifax, New Glasgow, Sydney, Truro and Yarmouth will offer the following evening classes according to the demand in each locality:

GENERAL CLASSES.

Business English,
Elementary Bookkeeping,
Advanced Bookkeeping.
Practical Arithmetic,
Practical Algebra, Geometry and Trigonometry.

MECHANICAL CLASSES.

Mechanical Drawing,
Machine Drawing,
Machine Design.

BUILDING CONSTRUCTION CLASSES.

Architectural Drawing,
Building Construction Drawing,
Architectural Design and Estimating.

ELECTRICAL CLASSES.

Elements of Electricity,
Direct Current Machinery,
Alternating Current Machinery.

CHEMISTRY CLASSES.

Elements of Chemistry,
Elements of Chemical Analysis,
Technical Chemical Analysis,
Metallurgical Chemistry.

TRADE CLASSES.

Garment Making.
Dressmaking.
Cooking and Home Economy.

ADMISSION TO CLASSES.

Any person wishing to enter a class must simply show the teacher that he is fitted to profit by the instruction.
There is no entrance Examination.

DEPOSIT.

Any person entering a class must deposit from $2.00 to $4.00 according to the class. The deposits for the various classes are as follows:

English	$2.00
Electrical Courses	4.50
Chemical Courses	4.50
Garment Making	4.50
Each of the other classes	3.00

This deposit must be made with the teacher during the first three weeks after the class opens.

REFUNDS.

At the end of the school term, in May, the deposit will be returned to the student on the basis of his attendance as follows:

The whole fee for . . . . . 100% attandance.
Four-fifths (4-5) for 90 to 99% attendance.
Two-thirds (2-3) for 80 to 90% attendance.
One-half (1-2) for 70 to 80% attendance.
Two-fifths (2-5) for 60 to 70% attendance.

If a student is absent for a good reason, such as sickness, bereavement, overtime work, work on night shift, etc., the teacher may count the student as present if the excuse be given to teacher immediately after each absence.

Under this arrangement a student who is present every night during the year gets all his deposit back and the class costs him nothing. Even if he does not make the 100% attendance, the class costs very little. Suppose a student takes a $4.50 course and has an attendance of 91%. In this case he receives back at the end of the year $3.60 and the whole winter's course has cost him only 90c.

We do not want your money but we ask a deposit to show that you are in earnest.

DESCRIPTION OF COURSES.

A short description of each course is given in the following pages to show roughly the ground covered.

BUSINESS ENGLISH.

The education of practically every person is judged by the way he speaks or writes. Incorrect English in conversation or in a letter has a great deal of influence in making bad impressions. In applying for a job or for a raise of wages, it is most important for a man to be able to talk or write simple, correct English. In every-day life, any person must be very careful in writing and speaking, if he would be looked upon as having an education, no matter how much he may know in other directions.

If you do not feel sure of your spelling or pronunciation or if you do not feel sure of the best way to write all kinds of letters, you should take the class for the winter.

PRACTICAL ARITHMETIC.

Arithmetic is at the basis of all industry, science, and business. Every man should have a good working knowledge of Arithmetic. The subject in our classes is taught from a practical standpoint and the problems are taken as far as possible from practical every-day work.

There are two, three, or four sections of this class. Some students are in an elementary grade who start in at long division, while others are doing advanced work in mensuration. Each section has only fifteen or twenty students, so that every individual gets attention and help from the teacher.

Just as much ground is covered in the year as the students are capable of doing. It has been found in these classes that the students cover two or three times as much ground in the same time, as they did when they went to day school.

PRACTICAL MATHEMATICS.

This class is a step in advance of the arithmetic classes. Only such parts of geometry, algebra and trigonometry as are found useful in practical life have been selected, and these are treated in a clear and simple manner. The greatest attention is given to mensuration, the handling of ordinary formulas, logarithms, and the properties of angles and triangles. The use of the slide rule is taught and this knowledge has been found to be of the greatest help to foremen in rapid calculations. This course prepares a man for the advanced courses of machine design and estimating, elements of electrical engineering, etc. None of these more advanced courses can be taken to advantage until the student has a good working knowledge of algebra, geometry and trigonometry.

BOOKKEEPING.

THREE YEAR COURSE

Now that mechanics have to keep their time on every job and foremen have to do so much time and cost keeping, it is a great help to almost all workmen to know something about this subject. A knowledge of bookkeeping is of great advantage to a young clerk and often forms the stepping stone to a position of greater responsibility.

A bare outline of the work is given below—

ELEMENTARY OR 1st YEAR CLASS.

How to keep a journal, day book, ledger, cash book, sales book, bill book, invoice book, etc.; how to keep and make up time; methods of checking, taking trial balances, closing ledger, etc.; how to open and run a bank account, shipping receipts, cheques, notes, drafts, etc.; single entry.

INTERMEDIATE OR 2nd YEAR CLASS

takes up Double Entry Bookkeeping as contained in Maritime "Double Entry Bookkeeping" to page 73, or equivalent.

ADVANCED OR 3rd YEAR CLASS

continues the work of the 2nd year, and will cover the remainder of the course as laid down in Maritime "Double Entry Bookkeeping," or equivalent.

MECHANICAL DRAWING CLASSES.

THREE YEAR COURSE.

MECHANICAL DRAWING.—1st Year.

This course is one of the most popular and most useful of those offered. Most men in the trades should know how to read drawings, and the best way to learn this is to be able to make a good, neat drawing. The actual things drawn are arranged so that they are very easy in the beginning and gradually increase in difficulty as the course goes on. A lesson or two is spent in getting accustomed to the use of the instruments and geometrical drawing and lettering, and then the student is plunged right into the drawing of real objects such as he meets every day. At the end of the first year's course a man should have learned how to make and understand any ordinary drawing.

Every mechanic should take this course. Think of the time and money that are wasted and the work that goes to the scrap-heap because blue prints are not thoroughly understood. Think of the great advantage it would be at some times when a bad break-down occurs, if you could make a neat, accurate sketch of the broken part which has to be replaced from some other shop. To-day every mechanic should be able to read blue prints as a scholar reads a book, and should also be able to draw fairly well.

2nd Year.—MACHINE DRAWING.

3rd Year.—MACHINE DESIGN.

These courses carry the student by easy steps to the drawing of more complex machine parts and the making of assembly drawings of these parts. In the third year the student is taught the strength of materials and the principles of mechanical powers as well as the methods of transmitting power by belts, gears, etc. At the end of these courses the student should be able to read and make any drawing he would meet in practical work.

BUILDING CONSTRUCTION CLASSES.

3 YEAR COURSE.

1st Year.—ARCHITECTURAL DRAWING.

This is the introductory course for carpenters, cabinet makers, pattern makers, bricklayers and stone cutters, corresponding to mechanical drawing for machinists. It deals with the details of construction, such as moldings, cornices, bonds in bricklaying, doors, sashes, window frames, and the plans of a simple house.

The principles of architectural drafting are thoroughly taught, and a man who passes the course should be able to sketch building details readily, and to make neat, accurate scale drawings of the same.

2nd. Year.—BUILDING CONSTRUCTION DRAWING:

3rd Year.—ARCHITECTURAL DESIGN.

These courses follow up and further develop the subject begun in the first year and carry the student through the details of framing, the details of various trusses, the strength and disposition of building materials, etc. Part of the last year is given to the practice of "taking off" material and making estimates of cost from plans.

ELECTRICIAL CLASSES.

3 YEAR COURSE.

The courses here are designed to give three years' progressive work in electricity.

1st Year.—ELEMENTS OF ELECTRICITY.

This is the first year's course in electricity, and the main idea is to ground the student thoroughly in the fundamental general laws of elementary electricity and magnetism. Every alternate evening session, or one-half of each session is devoted to laboratory work. where each student performs simple experiments that serve to fasten in his mind the laws that he is studying theoretically. Only such principles are treated as are commonly met with in practical work. Problems are introduced wherever possible.

Outline of work is as follows:

Fundamental Ideas and Definitions, Magnets, Primary and Secondary Batteries, Electrolysis and Electric Measurements.

2nd Year.—DIRECT CURRENT MACHINERY.

Electro-magentism, Mechanical Generation of a Current, Construction of a D. C. Dynamo and Motor, Types of D. C. Machines, Operation of D. C. Machines, Electric Lighting.

3rd Year.—ALTERNATING CURRENT MACHINERY.

This course covers the simpler portions of the theory of alternating current phenomena.

Alternating Currents, Alternating Current Apparatus, Incandescent Lighting, Telegraph Systems, Electric Transmission, Switchboard, Arc Lighting and Telephone Systems.

CHEMICAL CLASSES.

ELEMENTS OF CHEMISTRY.

The aim of this course is to introduce the fundamental laws of chemistry to the student as quickly and practically as possible. The course from the beginning is based on practical analysis for finding out what a substance is composed of. The regular established method of dividing the metals into groups as they are separated in qualitative analysis is followed and time enough is spent on each group and its compounds as they succeed each other to learn the peculiarities of that metal. The laws of chemical combination, the atomic theory and other fundamentals are taken up as they naturally appear. This course is three-fourths laboratory and one-fourth recitation with lecture experiments to illustrate every part of the subject.

ELEMENTS OF CHEMICAL ANALYSIS.

In this course regular qualitative analysis is taken up and all sorts of substances are analyzed to find out what they contain. Elementary quantitative analysis is undertaken toward the end of the term, each student going in some direction in analysis as is determined by his occupation. Practically all the work is carried on in the laboratory.

TECHNICAL CHEMICAL ANALYSIS.

This is a course in purely quantitative analysis. This is a chance for every student to specialize and to do iron and steel analysis, ore analysis, or even organic analysis if he so desires.

METALLURGICAL CHEMISTRY.

This is a special course in Chemistry designed to meet the needs of men in foundries, steel works, gas plants, etc. The subject is matter modified so that it shall bear directly on the practical every-day work of those men who are engaged in the steel industry.

DRESSMAKING.

The class in dressmaking aims to teach girls and women to sew and make garments in a workmanlike and stylish manner. It is not intended to train them to be dressmakers. The teachers will be thorough and competent dressmakers. Girls are expected to bring their own material.

The work will be carried on in three grades:

DRESSMAKING 1.

In this grade the girls will be taught plain sewing and how to make their own underclothes.

DRESSMAKING 2.

Pupils in this grade will be taught the fitting and making of shirt waists and blouses.

DRESSMAKING 3.

This is the highest class. In it the pupils are taught to make coats and skirts. Only those who are really proficient in the work of the preceding grades will be admitted to this class.

CERTIFICATE.

Whoever gets a pass mark of 75% or over in the year's work in any class will receive a certificate from the Department of Technical Education showing the work done. Such a certificate will enable the student to enter, without question, any advanced class which directly depends on the one passed.

DIPLOMA

Whoever passes successfully three successive classes in any one department such as the Mechanical, Building Construction, Electrical, Chemical, and in addition passes the classes in English, Arithmetic and Practical Mathematics will receive a full diploma from the Department of Technical Education.

The diploma will be given for any of the following groups of classes:

1. . . . . **English,**
Arithmetic,
Practical Mathematics,
Mechanical Drawing,
Machine Drawing,
Machine Design.

2. . . . . **English,**
Arithmetic,
Practical Mathematics,
Architectural Drawing,
Building Construction,
Architectural Design and Estimating.

3. . . . . **English,**
Arithmetic,
Practical Mathematics,
Elements of Electricity,
Dynamo Electric Machinery,
Elements of Electrical Engineering,
Electrical Laboratory,
Dynamo-Electrical Laboratory
Electrical Engineering Laboratory.

4. . . . . **English,**
Arithmetic,
Practical Mathematics,
Elements of Chemistry,
Elements of Chemical Analysis,
Technical Chemical Analysis.

For any further information apply to

F. H. Sexton, or

J. E. Barteaux,
Technical College, Halifax, N. S.

W. W. Casey,
Pleasant St., Amherst, N. S.

John T. McLeod,
Principal of the High School, New Glasgow.

J. L. TRASK,
888 *George St., Sydney*

or

W. F. Kempton,
Yarmouth, N. S.